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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 14 **January 1981** **No. 1**

Preface ..... i – xiv

General 1
(Phytotoxicity studies; information on production and use; and other items of general interest. Includes news items, letters and editorials appearing in scientific and technical journals.)

Monitoring and Residues 12
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 26
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 32
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 55
(Preparation of samples; analytical methods; instrumentation)

PESTICIDES ABSTRACTS

Preface

Included in this issue is a list of sources from which at least one article was abstracted for publication in either Volume 12 or 13; however, more than 2500 primary serials and secondary sources, books, and non-periodical publications are screened. Journal titles are abbreviated according to the format of the *Bibliographic Guide for Editors and Authors*, available from Chemical Abstracts Service. Japanese publications are listed by the Hepburn romanization of the complete title following the English title, if known.

ABH AKAD WISS DDR
ABSTR ANNU MEET AM SOC MICROBI
ACQUA ARIA
ACTA AGRIC SCAND
ACTA ALIMENT ACAD SCI HUNG
ACTA ALIMENT POL
ACTA BIOL ACAD
ACTA BIOL ACAD SCI HUNG
ACTA BIOL MED GER
ACTA CHIM ACAD SCI HUNG
ACTA CHIR SCAND SUPPL
ACTA DERM VENEREOL
ACTA ENDOCRINOL (COPENHAGEN)
ACTA ENTOMOL SINICA
ACTA FAC RERUM NAT UNIV COMENI
ACTA GENET MED GEMELLOL
ACTA HAEMATOL
ACTA HAEMATOL POL
ACTA HISTOCHEM
ACTA HISTOCHEM CYTOCHEM
ACTA HYDROBIOL
ACTA HYDROCHIM HYDROBIOL
ACTA MED POL
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ACTA MICROBIOL ACAD SCI HUNG
ACTA MICROBIOL BULG
ACTA NEUROPATHOL
ACTA OBSTET GYNECOL SCAND
ACTA PAEDIATR SCAND
ACTA PEDIATR JPN
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ACTA PHYSIOL SCAND SUPPL
ACTA PHYTOPATHOL ACAD SCI HUNG
ACTA SOC OPHTHALMOL JPN
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ACTA UNIV AGRIC BRNO FAC AG
ACTA VET SCAND
ADAS Q REV
ADV CANCER RES
ADV ENVIRON SCI TECHNOL
ADV EXP MED BIOL
ADV MOD TOXICOL
ADV PESTIC SCI
ADV PHARMACOL THER
ADV VET SCI COMP MED
AERONAUT J
AEROSOL AGE
AFINIDAD
AGE
AGRARTUD KOZL
AGRIC BIOL CHEM
AGRIC ECON RES
AGRIC ENG
AGRIC ENVIRON
AGRIC ITAL (PISA)
AGRIC RES
AGRIC RES J KERALA
AGRICULTURA (HEVER
AGRO-ECOSYSTEMS
AGROCHEMIA
AGROCHIMICA
AGROKEM TALAJTAN
AGROKHIMIYA
AGRON J
AICHE SYMP SER
AICHI IKA DAIGAKU IGAKAKAI ZAS
AKITA J RURAL MED
SEE AKITA-KEN NOSON IGAKKAI ZASSHI
ALEXANDRIA J AGRIC RES
ALIMENT VIE
AM BEE J
AM CITY COUNTY
AM FAM PHYSICIAN
AM IND HYG ASSOC J
AM J AGRIC ECON
AM J CLIN PATHOL
AM J EPIDEMIOL

AM J GASTROENTEROL
AM J HOSP PHARM
AM J HUM GENET
AM J MED
AM J OBSTET GYNECOL
AM J PATHOL
AM J PHYSIOL
AM J PROCTOL
AM J PUBLIC HEALTH
AM J TROP MED HYG
AM J VET RES
AM LAB
AM LUNG ASSOC BULL
AM POTATO J
AM REV RESPIR DIS
AM WATER WORKS ASSOC J
AMBIO
AN EDAFOL AGROBIOL
AN INST CERCET PROT PLANT ACAD
ANAL BIOCHEM
ANAL CHEM
ANAL CHEM
SEE BUNSEKI KAGAKU
ANAL CHIM ACTA
ANAL LETT
ANALUSIS
ANALYSIS
SEE BUNSEKI
ANALYST (LONDON)
ANAT REC
ANKARA UNIV VET FAK DERG
ANN AGRON
ANN ANAT PATHOL
ANN APPL BIOL
ANN ARID ZONE
ANN BIOL ANIM BIOCHIM BIOPHYS
ANN BIOL CLIN (PARIS)
ANN CHIM (ROME)
ANN FALSIF EXPERT CHIM
ANN INTERN MED
ANN IST SUPER SANITA
ANN MED VET
ANN NUTR ALIMENT
ANN NY ACAD SCI
ANN OCCUP HYG
ANN PHARM FR
ANN REP HIROSHIMA PREF AGRIC
ANN SCLAVO
ANN SURG
ANN UNIV MARIAE CURIE SKLODOWS
ANN ZOOL ECOL ANIM
ANNU R NAGASAKI PREFECT INST
ANNU R OKINAWA PREF
SEE OKINAWA-KEN
KOGAI-EISEI KENKYU
ANNU R YAMAGUCHI PREF
SEE YAMAGUCHI-KEN EISEI
KENKYUSHO
ANNU REP HIROSHIMA PREF AGR
ANNU REP INST IND MED
ANNU REV ENTOMOL
ANNU REV PHYTOPATHOL
ANTONIE VAN LEEUWENHOEK J MIC
ANZ SCHAEDLINGSKD PFLANZENSCH
AORN J
APPL ENVIRON MICROBIOL
APPL PHARMACOL
SEE OYO YAKURI
AQUA
AR AGRIC EXP STN MIMEOGRAPH SE
ARCH ANAT MICROSC MORPHOL EXP
ARCH BELG MED SOC HYG MED TRAV
ARCH BIOCHEM BIOPHYS
ARCH BIOL MED EXP
ARCH DERMATOL
ARCH DERMATOL RES
ARCH DIS CHILDH
ARCH ENVIRON CONTAM TOXICOL
ARCH ENVIRON HEALTH
ARCH EXP VETERINAERMED
ARCH FR PEDIATR
ARCH GESCHWULSTFORSCH
ARCH HYDROBIOL SUPPL
ARCH IMMUNOL THER EXP
ARCH INT PHARMACODYN THER
ARCH INT PHYSIOL BIOCHIM
ARCH INTERN MED
ARCH LEBENSMITTELHYG
ARCH MAL PROF MED TRAV SE
ARCH MED SADOWEJ KRYMINOL
ARCH MICROBIOL
ARCH NEUROL (CHICAGO)
ARCH PATHOL LAB MED
ARCH TOXICOL
ARCH VET ITAL
ARCH ZOOTEC
ARH FARM
ARH HIG RADA TOKSIKOL
ARIZ MED
ARKH ANAT GISTOL EMBRIOL
ARQ INST BIOL SAO PAULO
ARSSKR JAHRBUCH
ARZNEIM FORSCH
ASA SPEC PUBL (AM SOC AGRONOMY)
ASM NEWS
ATMOS ENVIRON
ATTI ACCAD NAZ LINCEI CL SCI F
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AUST J AGRIC RES
AUST J BIOL SCI

AUST J CHEM
AUST J EXP AGRIC ANIM HUSB
AUST J PLANT PHYSIOL
AUST N Z J MED
AUST SUGAR J
AUST VET J
AUST WILDL RES
AVIAN DIS
AVIAT SPACE ENVIRON MED
BAYER LANDWIRTSCH JAHRB
BEE WORLD
BEITR TABAKFORSCH
BEITR TROP LANDWIRTSCH VETE
BELG INST VERBETERING BEIT
BER KERNFORSCHUNGSANLAGE JUEL
BERL MUENCH TIERARZTL WSCHR
BERUFS-DERMATOSEN
BILT HMELJ SIRAK
BIOCHEM BIOPHYS ACTA
BIOCHEM BIOPHYS RES COMMUN
BIOCHEM J
BIOCHEM PHARMACOL
BIOCHEM PHYSIOL PFLANZEN
BIOCHEM SOC TRANS
BIOCHIM BIOPHYS ACTA
BIOINORG CHEM
BIOL CONSERV
BIOL NAUKI (MOSCOW)
BIOL REPRO
BIOL RUNDSCH
BIOLOGIA (BRATISLAVA)
BIOLOGICO
BIOLOGIST (PHI SIGMA SOC)
BIOMED MASS SPECTROM
BIOORG KHIM
BIOPHYS CHEM
BIOPHYS J
BIOSCIENCE
BIOTECHNOL BIOENG
BIOTECHNOL LETT
BIUL LUBEL TOW NAUK GEOGR
BLOOD
BOLL LAB CHIM PROV
BOLL SOC ITAL BIOL SPER
BONSEKI KAGAKU
BOT MAR
BR J CANCER
BR J CLIN PHARMACOL
BR J CLIN PRACT
BR J DERMATOL
BR J EXP PATHOL
BR J IND MED
BR J NUTR
BR J OPHTHALMOL
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BR J UROL
BR J VENER DIS
BR MED J
BR MYCOL SOC
BRAIN RES
BRAS ACUCAREIRO
BREAST
BROMATOL CHEM TOKSYKOL
BRONCHOPNEUMOLOGIE
BRUXELLES MED
BUILD RES ESTABL DIG
BULL ACAD NATL MED (PARIS)
BULL ACAD VET FR
BULL AT SCI
BULL CANCER
BULL ENTOMOL RES
BULL ENTOMOL SOC AM
BULL ENV PHYSIOPATHOL RESP
BULL ENVIRON CONTAM TOXICOL
BULL EXP BIOL MED
BULL INF INST BELGE AMELIOR BE
BULL JPN SOC SCI FISH
SEE NIPPON SUISAN GAKKAISHI
BULL MED LEG TOXICOL
BULL NAGANO RES INST HLTH POLI
BULL NATL CLGH POISON CONTR
BULL POSTGRAD INST MED EDU
BULL SOC CHIM FRANCE
BULL SOC ZOOL FR
BULL WHO
BYULL EKSP BIOL MED
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BYULL VSES INST EKSP VET
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C R SEANCES SOC BIOL PARIS
C R SOC BIOL
CAH NUTR DIET
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CAN J BIOCHEM
CAN J BOT
CAN J CHEM
CAN J COMP MED
CAN J FISH AQUAT SCI
CAN J FOR RES
CAN J GENET CYTOL
CAN J MICROBIOL
CAN J PHYSIOL PHARMACOL
CAN J PLANT SCI
CAN J PUBLIC HEALTH

CAN J SOIL SCI
CAN J ZOOL
CAN VET J
CANCER (PHILADELPHIA)
CANCER DETECT PREV
CANCER LETT
CANCER RES
CANCER TREAT REP
CANCER TREAT REV
CANE GROW J BULL
CARBOHYDR RES
CARCINOGENESIS
CAS LEK CESK
CELL BIOPHYS
CELL MOLEC BIOL
CELL STRUCT FUNTION
CELLUL CARTA
CELLULE
CEREAL FOODS WORLD
CESK HYG
CESK OFTALMOL
CESK PEDIATR
CHEM AGE (LONDON)
CHEM AGE INDIA
CHEM ANAL (WARSAW)
CHEM AUSTRALIA
CHEM BIOL INTERACT
CHEM BR
CHEM CANADA
CHEM ENG (BUDAPEST)
CHEM ENG (LONDON)
CHEM ENG (NY)
CHEM ENG NEWS
CHEM ERA
CHEM IND (LONDON)
CHEM MAG
CHEM MARK REP
CHEM N Z
CHEM PHARM BULL (TOKYO)
CHEM PHYS LIPIDS
CHEM SOC REV
CHEM TIMES TRENDS
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CHIM ACTUAL
CHIM IND
CHIMIA
CHIRURGIA (BUCHAREST)
CHIRURGIYA (MOSCOW)
CHROMATOGRAPHIA
CHRONOBIOLOGIA
CIBA CLIN SYMP
CIBA FOUND SYMP
CIENC AGRIC
CIENC CULT (SAO PAULO)
CIENCIAS (MADRID)
CIRC RES SUPPL
CITRUS IND
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CLAYS CLAY MINER
CLEVELAND CLIN Q
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CLIN RES
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CONSULTANT
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CONSUMER REP
CONTACT DERMATITIS
CONTRIB EPIDEMIOLOG BIOSTAT
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CRIT CARE MED
CROPS SOILS
CURR SCI
CYTOBIOLOGIE
CYTOLOGIA
DACCA UNIV STUD
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DATEN DOK UMWELTS
DEF VEG
DEP AGRIC NEW SOUTH WALES REP
DERM BERUF UMWELT
DERMATOL MONATSSCHR
DERMATOL VENEROL (SOFIA)
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DEV NEUROSCI
DEV SOIL SCI
DEV TOXICOL ENVIRON SCI
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DOC PEDOZOOL
DOKL AKAD NAUK ARM SSR
DOKL AKAD NAUK AZ SSR
DOKL AKAD NAUK SSSR
DOKL BOLG AKAD NAUK
DOKL VSES AKAD SKH NAUK
DOPOV AKAD NAUK UKR RSR
DOWN EARTH
DRUG CHEM TOXICOL
DRUG INTELL CLIN PHARM
DRUG METAB DISPOS
DRUG THER
DRUG THERAPY
DTSCH FORSCHUNGSDIENST
DTSCH GESUNDHEITSWES
DTSCH HYDROGR Z
DTSCH LEBENSM RUNDSCH
DTSCH MED WOCHENSCHR
DTSCH TIERAERZTL WOCHENSCHR
ECOL BULL
ECOL MODELLING
ECOLOGY
ECOTOXICOL ENVIRON QUAL
ECOTOXICOL ENVIRON SAF
EDUC CHEM
EFFLUENT & WATER TREAT J
EGESZSEGTUDOMANY
EGYPT J CHEM
EGYPT J SOIL SCI
EISEI SHIKENJO HOKOKU
EKOL POL
EKOLOGIYA
EKSP MED MORFOL
EKSP VODN TOKSIKOL
ELECTROENCEPHALOGR CLIN NEUROP
ELEKTRON OBRABOTKA MATER
ELELMEZ IPAR
ELELMISZERVIZSALATI KOZL
EMERG MED
ENTOMON
ENTOMOPHAGA
ENVIRON BIOL FISH
ENVIRON CONSERV
ENVIRON ECOL CHEM
SEE SEITAI NO KAGAKU
ENVIRON ENTOMOL
ENVIRON EXP BOT
ENVIRON HEALTH
ENVIRON HEALTH CRITERIA
ENVIRON HEALTH PERSPECT
ENVIRON INT
ENVIRON MANAGE
ENVIRON POLLUT
ENVIRON RES
ENVIRON SCI RES
ENVIRON SCI TECHNOL
ENVIRONMENT
ENZYME
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EPA J
EPIDEMIOL REV
ERNAHR UMSCHAU
ESSAYS BIOCHEM
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ESTUARIES
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EUR ENVIRON MUTAGEN SOC
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EUR J CANCER
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EUR J CLIN INVEST
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EXCERPTA MED INT CONGR SER
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EXP GERONTOL
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EXP MOL PATHOL
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FAMILY HEALTH
FAO PLANT PROT BULL
FARM CHEM
FARM TIJDSCHR BELG
FARM ZH
FARM ZH (KIEV)
FARMACO ED PRAT
FARMAKOL TOKSIKOL (MOSCOW)
FARMATSIYA (MOSCOW)
FDA CONSUMER
FEBS LETT
FED PROC FED AM SOC EXP BIOL
FEMS MICROBIOL LETT
FERTIL STERIL
FETTE SEIFEN ANSTRICHM
FIRE COMMAND
FISH BULL
FISHERIES
FIZIOL BIOKHIM KUL'T RAST
FIZIOL RAST
FIZIOL ZH (KIEV)
FLA ENTOMOL

FLA GROW RANCHER
FLEISCHWIRTSCHAFT
FLORA
FOLIA BIOL
FOLIA HISTOCHEM CYTOCHEM
FOLIA MORPHOL (PRAGUE)
FOOD CAR
FOOD COSMET TOXICOL
FOOD ENG
FOOD POLICY
FOOD SANIT RES
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FOOD TECHNOL AUST
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FRONT PLANT SCI
FUKUSHIMA IGAKU ZASSHI
G CLIN MED (BOLOGNA)
GA AGRIC EXP STN RES BULL
GALVANOTECNICA
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GARTENBAU
GARTENBAUWISSENSCHAFT
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GASTROENTEROLOGY
GEKKAN YAKUJI
GEN PHARMACOL
GENDAI IRYO
GENETICS
GENETIKA
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GESUNDE PFLANZ
GHANA J AGRIC SCI
GIG SANIT
GIG TR PROF ZABOL
GINEKOL POL SUPPL
GIT FACHZ LAB
GRADINAR LOZAR NAUKA
GRASAS ACEITES (SEVILLE)
GROWTH
GRUNDFOERBAETTRING
HAEMATOL BLUTTRANSFUS
HAGASAKI-KEN EISEI KOGAIKENKYU
HAREFUAH
HAUTARZT
HEREDITY
HIDROL KOZL
HIDROTEHNICA
HIFU RINSHO
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HIFUKA NO RINSHO
HIROSHIMA J MED SCI
HIROSHIMA UNIV MED MAG
SEE HIROSHIMA DAIGAKU
IGAKU ZASSHI
HIROSHIMA-KENRITSU NOGYOSHIKEN
HISTOCHEMISTRY
HISTOPATHOLOGY
HOLZTECHNOLOGIE
HOPPE-SEYLER'S Z PHYSIOL CHE
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IND CONSERVE
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IND WASTES (CHICAGO)
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INDIAN J MED RES
INDIAN J PHARMACOL
INDIAN J PHYSIOL PHARMACOL
INDIAN J POULT SCI
INDIAN SUGAR
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INIS ATOMINDEX
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INT BIODETERIOR BULL
INT J BIOCHEM
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INT PEST CONTROL
INT REV EXP PATHOL
INT SUGAR J
INT SYMP CROP PROT
INTERDISCIP SCI REV
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J AGRIC CHEM SOC JPN
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J AGRIC FOOD CHEM
J AGRIC SCI
J AGRIC UNIV P R
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SEE AICHI IKA DAIGAKU IGAKUKAI ZAS
J AIR POLLUT CONTROL ASSOC
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J AM WATER WORKS ASSOC
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J APPL ECOL
J AQUA PLANT MANAGE
J ASSOC OFF ANAL CHEM
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J AUST INST AGRIC SCI
J BACTERIOL
J BIOCHEM BIOPHYS METHODS
J BIOL CHEM
J CAN DIET ASSOC
J CANCER RES CLIN ONCOL
J CELL BIOL
J CELL PHYSIOL
J CELL SCI
J CHART INST BUILD SERV
J CHROMATOGR
J CHROMATOGR SCI
J CHRONIC DIS
J CLIN HEMATOL ONCOL
J COLLOID INTERFACE SCI
J COMBUSTION TOXICOL
J COMP PATHOL
J COMPARAT PATHOL
J DENT RES
J ECON ENTOMOL
J ELECTRON MICROSC
J ELISHA MITCHELL SCI SOC
J ENDOCRINOL
J ENTOMOL RES
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J ENVIRON SCI HEALTH B
J ENVIRON SCI HEALTH C
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J FERMENT TECHNOL
J FISH BIOL
J FISH DIS
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J FLUORINE CHEM
J FOOD HYG SOC JPN
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J FOOD PROCESS PRESERV
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J FOOD SCI TECHNOL
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J INDIAN INST SCI SECT C
J INORG NUCL CHEM
J INSECT PHYSIOL
J INST CHEM (INDIA)
J INST WATER ENG SCI
J INVERTEBR PATHOL
J INVEST DERMATOL
J IR MED ASSOC
J IWATE MED ASSOC
SEE IWATE IGAKU ZASSHI
J J APPL ENTOMOL ZOOL
J JPN ASSOC RURAL MED
SEE NIPPON NOSON IGAKKAI ZASSHI
J KANS ENTOMOL SOC
J LAB CLIN MED
J LABELLED COMPD RADIOPHARM
J LIQUID CHROMATOGR
J LUMIN
J MED ASSOC OKAYAMA
SEE OKAYAMA IGAKKAI ZASSHI
J MED CHEM
J MED SOCSOC TOHO UNIV
SEE TOHO IGAKKAI ZASSHI
J MISS STATE MED ASSOC
J N ENGL WATER WORKS ASSOC
J NARA MED ASSOC
SEE NARA IGAKU ZASSHI
J NATL CANCER INST
J NATL SCI COUNC SRI LANKA
J NEMATOL
J NEUROCHEM
J NEUROCYTOL
J NEUROPATHOL EXP NEUROL
J NUCL AGRIC BIOL
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J PATHOL
J PEDIAT PRACT
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J PEDIATR
J PESTIC SCI
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J PHARMACOBIO-DYN
J PHARMACOKINET BIOPHARMAC
J PHARMACOL
J PHARMACOL EXP THER
J PHYSIOL (PARIS)
J PLANT NUTR
J POLYM SCI POLYM LETT ED
J PROTOZOOL
J R SOC MED
J RADIOANAL CHEM
J RANGE MANAGE
J S AFR VET ASSOC
J S C MED ASSOC
J SCI AGRIC SOC FINLAND
J SCI FOOD AGRIC
J SCI IND RES
J SOC OCCUP MED
J SOLID-PHASE BIOCHEM
J STEROID BIOCHEM
J STORED PROD RES
J THEOR BIOL
J THERAPY
SEE CHIRYO
J TOXICOL ENVIRON HEALTH
J TOXICOL SCI
J TROP MED HYG
J ULTRASTRUCT RES
J UROL
J WATER POLLUT CONTROL FED
J WILDL MANAGE
JPN ENVIRON WHITEPAPR FUKUSHIM
JPN J CLIN DERMATOL
SEE RINSHO HIFUKA
JPN J EXP MED
JPN J FOOD NUTR
SEE EIYO TO SHOKURYO
JPN J HYG
SEE NIPPON EISEIGAKU ZASSHI
JPN J IND HEALTH
SEE SANGYO IGAKU
JPN J LEGAL MED
SEE NIPPON HOIGAKU ZASSHI
JPN J MED SCI BIOL
JPN J PHARMACOL

JPN J PUBLIC HEALTH
SEE NIPPON KOSHU EISEI ZASSHI
JPN J SANIT ZOOL
SEE EISEI DOBUTSU
JPN REV CLIN OPHTHALMOL
SEE GANKA RINSHO IHO
JPN SCI SOC PRESS TOKYO
JUI KAI
JUSTUS LIEBIGS ANN CHEM
K VET LANDBOHOEJSK ARSSKR
KAGAKU NO RYOIKI
KAGOSHIMA-KEN EISEI KENKYUSHO
KANAGAWA-KEN EISEI KENKYUSHO
KANZO
KEM TIDSKR
KHIDROBIOLOGIIA
KHIG ZDRAVEOPAZ
KHIM FARM ZH
KHIM SEL'SK KHOZ
KHLOPKOVODSTA
KHRANIT PROM-ST
KIDNEY INT
KINKI DAIGAKU IGAKUZASSHI
KITAKANTO IGAKU
KLIN MED (MOSCOW)
KLIN WOCHENSCHR
KONSERVN OVOSHCHESUSH PROMST
KRIM FORENSISCHE WISS
LA AGRIC
LAB ANIM
LAB ANIM SCI
LAB INVEST
LAB MED
LAB PRACT
LABO-PHARMA PROB
LAIT
LAKARTIDNINGEN
LANCET
LANDWIRTSCH FORSCH
LARKARTIDNINGEN
LATV PSR ZINAT AKAD VESTIS
LEBENSMITTELCHEM GERICHTL CH
LERNEN LEISTEN
LIFE SCI
LIMNOL OCEANOGR
LIQ CHROMATOGR ANAL
LLOYDIA
LUFTHYG SILIKOSEFORSCH
MADA
MAGY ALLATORV LAPJA
MAGY KEM FOLY
MAGY KEM LAPJA
MAGY ONKOL
MAGY TUD
MALACOLOGIA
MAMMAL REV
MANEDSSKR PRAKT LAEGEG
MANUF CONFECT
MAR BIOL
MAR ECOL
MAR ENVIRON RES
MAR FISH REV
MAR POLLUT BULL
MATER ORG
MATER PERFORM
MCDERMOTT W H
MD COOP EXT SERV BULL
MED BIOL
MED CLIN NORTH AM
MED HYPOTHESES
MED J AUST
MED PR
MED PREGL
MED WELT
MED WETER
MED WORLD NEWS
MED ZH UZB
MEDED FAC LANDBOUWWET RIJKSUNI
MEDICAL TIMES
MEDICINA (BUENOS AIRES)
MEERESFORSCHUNG
MELD NORG LANDBRUKSHOEGSK
METHODS BIOCHEM ANAL
MFG CHEM & AEROSOL NEWS
MICROB ECOL
MICROBIOLOGY (USSR)
MICROBIOS
MICROBIOS LETT
MICROCHEM J
MICRON
MICROSOMES DRUG OXID CHEM
MIE IGAKU
MIKOL FITOPATOL
MIKROBIOL ZH (KIEV)
MIKROBIOLOGIYA
MIKROCHIM ACTA
MILCHWISSENSCHAFT
MILLING FEED FERT
MINERVA MED
MITT GEB LEBENSMITTELUNTERS HY
MN AGRIC EXTN SERV EXTN BULL
MOL BIOL (MOSCOW)
MOL PHARMACOL
MON LABOR REV
MONATSH KINDERHEILKD
MONATSH VETERINAERMED
MONTASH VETERINAERMED
MOPRA
MORBID & MORTAL WKLY RPT

MOSG NEWS
MUENCH BEITR ABWASSER FISCH
MUENCH MED WOCHENSCHR
MUTAT RES
N ENGL J MED
N Y ACAD SCI SCI WEEK
N Y FISH GAME J
N Z J AGRIC
N Z J EXP AGRIC
N Z J FOR SCI
N Z J MED LAB TECHNOL
N Z J SCI
N Z MED J
NACHR DTSCH PFLANZENSCHUTZDIEN
NAHRUNG
NAIKA SHIRIZU
NASA AEROSP MED BIOL
NAT CAN
NATION
NATION'S HEALTH
NATL ACAD SCI LETT
NATL CANCER INST MONOGR
NATURE (LONDON)
NATURWISS RUNDSCH
NATURWISSENSCHAFTEN
NAUNYN-SCHMIEDEBERGS ARCH PHARMACOL
NCI TECH REP SER
NED TIJDSCHR GENEESKD
NEOPLASMA
NEPHRON
NETH J AGRIC SCI
NETH J PLANT PATHOL
NEUROL NEUROCHIR POL
NEUROLOGY
NEUROPATOL POL
NEUROTOXICOLOGY
NEW SCI
NEWS REP
NEWS REP NATL ACAD SCI
NIOSH SCI SYMP
NIPPON DAIGAKU IGAKU ZASSHI
NIPPON DOJO HIRYOGAKU ZASSHI
NIPPON DOJO-HIRYOGAKA ZASSHI
NIPPON HIFUKA GAKKAI ZASSHI
NIPPON KAGAU KAISHI
NIPPON KAIMENI GAKKAI ZASSHI
NIPPON NAIKA GAKKAI ZASSHI
NIPPON SAIGAI-IGAKKAI KAISHI
NIPPON UNIV MED J
SEE NICHIDAI IGAKU ZASSHI
NIPPON YAKURIGAKU ZASSHI
NOGYO OYOBI ENGEI
NORDISK VETERINAERMED
NORSK INST SKOGFORSK
NOUV PRESSE MED
NOVENYVEDELEM
NUCL SAF
NUOVI ANN IG MICROBIOL
NURS MIRROR
NURSING MIRROR
NUTR CANCER
NUTR REP INT
NVEST PESQ
OBSTET GYNECOL SURV
OCCUP HEALTH NURS
OCCUP SAF HEALTH REP
OCEAN MANAGE
OCHR PR
OECOLOGIA
OHIO REP
OIKOS
OK AGRIC EXP STN RES REP
OLEAGINEUX
ONCOL TIMES
ONCOLOGIA (BUCHAREST)
ONCOLOGY
OPT SPECTROSC (USSR)
OPT SPEKTROSK
ORG MAGN RESON
ORG MASS SPECTROM
ORG PREP PROCED INT
ORG VERUNREINIG
ORGANIKA
ORV HETIL
OSAKA SHIRITSU KANKYO KAGAKU
OSTRICH
OUTLOOK AGRIC
PAK J ZOOL
PANS (PEST ARTIC NEWS SUMM)
PARASITICA
PATH RES PRACT
PATHOLOGY
PATIENT CARE
PATOL POL
PEDIATR AKUSH GINEKOL
PEDIATR ANN
PEDIATR NURS
PEDIATR RES
PEDIATRICS
PEDIATRIE
PEST CONTROL
PESTIC BIOCHEM PHYSIOL
PESTIC MANAGE INSECTIC RESIST
PESTIC MONIT J
PESTIC SCI
PESTICIDES
PFLANZENARZT
PFLUEGERS ARCH
PHARM WEEKBL
PHARMACHOCHEM LIBR

PHARMACOL BIOCHEM BEHAV
PHARMACOL RES COMMUN
PHARMACOL REV
PHARMACOL THER PART A
PHARMACOLOGIST
PHARMAZIE
PHILOS TRANS R SOC LONDON SER
PHOSPHORUS SULFUR
PHOTOCHEM PHOTOBIOL
PHYSIOL PLANT
PHYSIOLOGIST
PHYTIATR PHYTOPHARM
PHYTOPARASITICA
PHYTOPATHOL Z
PLANT ENG
PLANT MED PHYTOTHER
PLANT PATHOL
PLANT PHYSIOL
PLANT PROTECT
SEE SHOKUBUTSU BOEKI
PLANT SOIL
POL ARCH HYDROBIOL
POL J PHARMACOL PHARM
POL J SOIL SCI
POL TYG LEK
POLLUT ATMOS
POLYTECH TIJDSCHR PROCESTECH
POSTEPY NAUK ROLN
POSTGRAD MED
POSTGRAD MED J
POULT SCI
PRAC LEK
PRACTITIONER
PRAX NATURWISS BIOL
PREV MED
PRIRODA (SOFIA)
PROBL KHIG
PROBL TUBERK
PROC AM ASSOC CANCER RES
PROC ANAL DIV CHEM SOC
PROC ANNU MAR COAT CONF
PROC ANNU MEET JPN SOC IND HYG
PROC ANNU TECH MEET INST
PROC ASTM
PROC AUSTR PHYSIOL PHARMACOL
PROC BR CROP PROT COUNCIL
PROC EUR SOC TOXICOL
PROC FLA STATE HORTIC SOC
PROC HUNG ANNU MEET BIOCHEM
PROC INDIAN NATL SCI ACAD B
PROC JAPAN ACAD
PROC N CENT WEED CONTROL CONF
PROC N D ACAD SCI
PROC NATL ACAD SCI USA
PROC NORTHEAST WEED SCI SOC
PROC OKLA ACAD SCI
PROC R SOC LONDON SER B
PROC UTAH MOSQ ABATEMENT ASS
PROC WEST PHARMACOL
PROC WEST SOC WEED SCI
PROCESS BIOCHEM
PROFESSIONAL SAFETY
PROG BIOCHEM PHARMACOL
PROG CLIN BIOL RES
PROG DRUG RES
PROG EXP TUMOR RES
PROG FISH CULT
PROG MED CHEM
PROG MED GENET
PROG WATER TECHNOL
PROGR FISH CULT
PROSTAGLANDINS MED
PROTECTION
PRUM POTRAVIN
PRZEGLAD LEK
PSYCHOPHARMACOLOGY
PUBLIC HEALTH REP
PUBLIC HYGIENE
SEE KOSHU EISEI
PUBLIC WORKS
PULP PAP CAN
PURE APPL CHEM
PYRETHRUM POST
Q REV BIOPHYS
QUANT MASS SPECTROM
RADIAT ENVIRON BIOPHYS
RADIOBIOLOGIYA
RADIOCHEM RADIOANAL LETT
RADIOISOTOPES
RASS CHIM
RECENTI PROG MED
RECL MED VET
REIHE
REND ACCAD SCI FIS MAT NA
REP SHIMANE PREFECT INST PUBLI
RES COMMUN CHEM PATHOL PHARMAC
RESIDUE REV
RESPIR CARE
REV AGRIC (BRUSSELS)
REV AGROQUIM TECHNOL ALIMENT
REV BIOCHEM TOXICOL
REV CAN BIOL
REV CHIM (BUCHAREST)
REV ECOL BIOL SOL
REV ESP ONCOL
REV IG BACTERIOL VIRUSOL
REV INT OCEANOGR MED
REV MED CHIR
REV MED SUISSE ROMANDE
REV PRAT

REV ROUM BIOCHIM
REV ROUM BIOL SER BIOL ANIM
REV SANID HIG PUBLICA
REV SOC QUIM MEX
RHOD J AGRIC RES
RINSHO TO KENKYU
RISO
RIV SOC ITAL SCI ALIMENT
ROCZ AKAD MED B
ROCZ AKAD ROLN POZNANIU
ROCZ PANSTW ZAKL HIG
ROSTL VYROBA
S AFR J SCI
S AFR MED J
S KH BIOL
SAISHIN IGAKU
SAKH PROM
SAKH SVEKLA
SANGRE
SANT PUBLIQUE (BUCUR)
SCAND J CLIN LAB INVEST
SCAND J GASTROENTEROL
SCAND J WORK ENVIRON HEALTH
SCHWEIZ MED WOCHENSCHR
SCI CULT
SCI NEWS
SCI PHARM
SCI TOTAL ENVIRON
SCIENCE
SCIQUEST
SCOTT MED J
SECURITAS
SENDAI-SHI EISEI SHIKENJO SHOH
SENTEN IJO
    SEE CONGENITAL ANOMALIES
SHIKOKU J PUBLIC HEALTH
    SEE SHIKOKU KOOSHU
        EISEIGAKU ZASSH
SHIMANE-KEN EISEI KOGAI KENKYU
SHOKUCHO
SHONIKA RINSHO
SHOWA NENDO KOSEISHO GAN-KENKY
SITZUNGSBER AKAD WISS DDR
SMITHSON INST RES REP
SOAP COSMET CHEM SPEC
SOGO RINSHO
SOIL BIOL BIOCHEM
SOIL CROP SCI SOC FL PROC
SOIL ENZYMES
SOIL SCI
SOIL SCI SOC AM J
SOMATIC CELL GENET
SOOBSHCH AKAD NAUK GRUZ SSR
SOUTH MED J
SOUTHWEST ENTOMOL
SOV MED
SOV SOIL SCI
SPAN PROGR AGRIC
ST MARIANNA MED J
    SEE ST MARIANNA
        IKADAIGAKU ZASSHI
STAIN TECHNOL
STAUB REINHALT LUFT
STEROIDS
STUD CERCET BIOCHIM
STUD ENVIRON SCI
SUCR BELGE
SUGAR AZUCAN
SUGAR NEWS
SUISAN ZOSHOKU
SYMP BIOL HUNG
SYMP SKIN INTERN DIS
SYNDETS SAPCON I COSMET AEROS
TAIWAN SUGAR
TALANTA
TAMANASHI-KENRITSU EISEI-KOGAI
TECH SCI MUNIC
TECHNOL REV
TEHNOL MESA
TER ARKH
TERATOLOGY
TETRAHEDRON
TETRAHEDRON LETT
TEX J SCI
THEOR APPL GENET
THER HUNG
THERAPIE
THERAPIEWOCHE
THORAX
TOB INT
TOB SCI
TOHOKU J EXP MED
TOKYO TORITSU EISEI KENKYUSHO
TOXICOL ANNU
TOXICOL APPL PHARMACOL
TOXICOL EUR RES
TOXICOL LETT
TOXICOL OCCUPAT MED
TOXICOLOGY
TOXICON
TR INST EKSP
TRANS AM FISH SOC
TRANS ASAE
TRANS BR MYCOL SOC
TRANS KANS ACAD SCI
TRANS N AM WILDL NAT RESO
TRANS NEBR ACAD SCI AFFIL SOC
TRANS R SOC TROP MED HYG

TRANS SOC PATHOL JPN
SEE NIPPON BYOORIGAKKAI KAISHI
TRAV SOC PHARM MONTPELLIER
TRENDS BIOCHEM SCI
TRENDS NEUROSCI
TRENDS PHARMACOL SCI
TSITOL GENET
TSITOLOGIYA
TUMORI
TURRIALBA
TX AGRIC EXP STN MISC PUBL
UGESKR LAEG
UKR BIOKHIM ZH
UKR KHIM ZH
UMSCH WISS TECH
UNDERSEA BIOMED RES
UNDERWATER NAT
UROLOGY
USP KHIM
UZB KHIM ZH
VA J SCI
VAEXTSKYDSRAPPORT
VAR FOEDA
VERH DTSCH GES INN MED
VESTI AKAD NAVUK BSSR (MINSK)
VESTN AKAD MED NAUK SSSR
VESTN AKAD NAUK SSSR
VESTN DERMATOL VENEROL
VESTN SKH NAUKI KAZ
VESTSI AKAD NAVUK B SSR SER
VET ARH
VET CLIN N AM SMALL ANIM PRACT
VET HUM TOXICOL
VET MED (PRAGUE)
VET MED NAUKI
VET MED SMALL ANIM CLIN
VET PARASITOL
VET PATHOL
VET REC
VETERINAERMED
VETERINARIYA (MOSCOW)
VETERINARSTVI
VIRCHOWS ARCH A
VIROLOGY
VNITRNI LEK
VOEDINGSMIDDELEN TECHNOL
VOEN MED ZH
VOM WASSER
VOPR MED KHIM
VOPR PITAN
VRACH DELO
WABOLU-BER
WASSERWIRTSCH WASSERTECH
WASTE AGE
WATER & SEWAGE WORKS
WATER AIR SOIL POLLUT
WATER AND WASTE WATER
SEE YOSUI TO HAISU
WATER POLLUT CONTROL
WATER RES
WATER RESOUR BULL
WATER S AFR
WATER WASTE TREAT
WATER WASTES ENG
WEED RES
WEED SCI
WEST J MED
WIAD CHEM
WIAD LEK
WIAD PARAZYTOL
WIEN MED WOCHENSCHR
WIERNER TIERARZTL MONATSSCHR
WILDL MONOGR
WILHELM ROUX ARCH DEV BIOL
WILSON BULL
WIS MED J
WISS BEITR MARTIN LUTHER U H W
WISS Z TECH UNIV DRESDEN
WOOD SCI TECHNOL
WORLD HEALTH
WORLD REV NUTR DIET
WORLDWIDE REP EPIDEMIOL
XENOBIOTICA
YAKKYOKU
YALE J BIOL MED
YALE SCI
YAMAGUCHI MED J
SEE YAMAGUCHI IGAKU
YAMAGUCHI-KEN NOGY
YOKOHAMA IGAKU
YU-KAGAKU
YUKI GOSEI KAGAKU KYOKAI SHI
YUSHI
Z ALLG MED
Z ALLG MIKROBIOL
Z CHEM
Z ERKR ATMUNGSORGANE
Z ERNAEHRUNGSWISS
Z GESAMTE HYG IHRE GRENZGEB
Z GESAMTE INN MED IHRE GRENZGE
Z LEBENSM UNTERS FORSCH
Z NATURFORSCH TEIL C
Z PFLANZENERNAEHR BODENKD
Z PFLANZENKR PFLANZENSCHUTZ
Z TIERPHYSIOL TIERERNAEHR
Z WASSER ABWASSER FORSCH
ZASHCH RAST (MOSCOW)
ZENTRALBL ARBEITSMED
ZENTRALBL BAKTERIOL ABT II
ZESZ NAUK AKAD ROLN TECH OLSZT
ZESZ NAUK PLITECH LODZ CHE

ZESZ PROBL POSTEPOW NAUK ROLN
ZH ANAL KHIM
ZH EVOL BIOKHIM FIZIOL
ZH NEVROPATOL PSIKHIATR IM
ZH OBSHCH KHIM
ZH PRIKL KHIM
ZH VSES KHIM OVA
ZUCKERINDUSTRIE
ZUCKERRUBENBAU

81-0001. Turner, K. (Tech. Res. Cent., Reckitt & Colman, Cape Town, Republic of South Africa) **Specifications for aerosol insecticide surface sprays using Malvern data.** *Aerosol Age* 25(10): 32-34; 1980.

The results of a study on the Malvern particle sizer are the basis for a proposed definition for surface insecticide sprays. Surface aerosol insecticide sprays should not contain more than 5% (m/m) of particles < 50 μ in diameter, or more than 20% particles > 250 μ in diameter, when used at 5 cm from the actuator. A method for the selection of PE (size) and W (spread) values is presented in graph form, so that distributions can be arranged to satisfy both of the above conditions. This method can be applied to any class of surface insecticide sprays. It is concluded that the use of this distribution can reduce the hazards of surface sprays and is also a simple, rapid and unbiased test that can be used to check the conformity of particle sizes.

81-0002. Ladonin, V. F.; Chesalin, G. A.; Samoilov, L. N. (All-Union Res. Inst. Fert. & Agron. Soil Sci., Moscow, USSR) Primenenie ^{15}N dlia izucheniva deistviya gerbitsidov na kulturnye i sornye rasteniya. I. Isopolzovanie azota udopreniya kulturnymi i sornymi rasteniyami. [Use of ^{15}N **for analysis of herbicides effect on crop and weeds. I. Assimilation of nitrogen from fertilizers by crop and weeds.**] *Agrokhimiya* (8): 13-18; 1980 (8 references) (Russian).

^{15}N-labeled 2,4-D, dicamba and their mixtures were used to analyze the competition for nitrogen between weeds and crops. It was found that all weeds showed more intensive assimilation of nitrogen than wheat, pea, maize, barley, and flax plants. These findings indicate that the early applications of herbicides would preclude competitive assimilation of nitrogen by weed plants.

81-0003. Cairns, J., Jr.; Dickson, K. L.; Maki, A. W. (Biol. Dep., Cent. Environ. Stud., Virginia Polytech. Inst. & State Univ., Blacksburg, VA 24061) **Introduction.** *ASTM STP 657:* pp. 3-11; 1978.

This report is a review of a workshop on evaluation of the state of the art of the philosphies, problems, and needs for assessing the hazards of chemical substances to aquatic life. The workshop considered toxicological effects, environmental concentrations, environmental fates, hazard assessment, and the evaluation of proposed test procedures for estimating hazards to aquatic life. The terms safety and risk are defined as they are uses in the workshop. A chemical was judged to be safe if the risks associated with its use were concluded to be acceptable. [Abstracts of papers presented at this meeting are included in this issue of *Pesticides Abstracts.*]

81-0004. Smith, L. L., Jr.; Sprague, J. B.; deOude, N. T. (Dep. Entomol., Univ. Minnesota, Minneapolis, MN 55400) **Discussion session synopsis.** *ASTM STP 657:* pp. 147-149; 1978.

This discussion session involved the evaluation of environmental hazard. In this synopsis the applicability of hazard assessment procedures is considered. The approach currently used by industry is concluded to be useful in both product development and regulatory requirements for which hazard assessments of a wide range of compounds are needed. Means of determining the necessity for additional individual tests, program termination, or a progression through tier tests to final hazard evaluation is stressed. The acceptance of a degree of risk suggested to be a sociopolitical judgement, not a scientific one. The hazard assessment procedure presented is concluded to reflect the current state of the art, and is predicted to improve with use.

81-0005. Cairns, J., Jr.; Dickson, K. L.; Maki, A. W. (Biol. Dep., Cent. Environ. Stud., Virginia Polytech. Inst., Blacksburg, VA 20461) **Summary and conclusions.** *ASTM STP 657:* pp. 191-197; 1978.

The goal of this workshop was to evaluate the state of the art in assessing the hazards of chemical substances to aquatic life. It is concluded that hazard assessment must be based on evaluation of predicted environmental concentrations of a substance and its toxicological properties. Topics covered in this summary include the assessment of effects on aquatic life, the design of hazard assessment procedures, the safety factor concept, and the identification of research needs.

81-0006. Eaton, J. G., ed.; Parrish, P. R., ed.; Hendricks, A. C., ed. (US EPA, Duluth, MN 55804) ***Aquatic Toxicology.* Proceedings of the Third Annual Symposium on Aquatic Toxicology.** *ASTM STP 707:* 405 pp.; 1980.

Areas considered at the third annual aquatic toxicology symposium include toxicology methods development; water quality management; effluent testing; and the physiology and behavior effects of single toxicants. The development of short sub-lethal toxicity tests, the use of bio-indicator organisms with shorter life-cycles that are sensitive to pollutants or toxicants, and the use of embryo-larval fish instead of mature organisms are presented in detail. A majority of the papers were concerned with the area of bioconcentration, including determination and assay methods, the relationship to the physical properties of water, and the development of monitoring systems and how data on these concentrated chemicals can be used for regulating toxic levels in the aquatic environment. Short-term, acute and chronic toxicities of single toxicants were examined in various fish and crustacean species with emphasis on the impairment of the behavioral or physical mechanisms in these organisms. Abstracts of papers from this symposium will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-0007. Sheffy, T. B. (Bur. Water Qual., Wisconsin Dep. Nat. Res., Madison, WI 53707) **The PCB monitoring program in Wisconsin – surveillance strategy and use of data.** *ASTM STP 707:* pp. 155-163; 1980 (3 references).

A report on the Wisconsin PCB monitoring program is presented. Since 1970, 2500 samples of fish have been analyzed for PCB content. The Department of Health and Society Services reviews the data and makes recommendations concerning the consumption of contaminated fish. A list of regions is provided from which fish should not be eaten. PCB levels in carp have been noted as high as 750 μg/g, 241.5 μg/g in walleye, 41.8 μg/g in black bullheads, and 55 μg/g in northern pike. Data is provided to both sport and commercial fishermen to enable then to harvest fish with low levels of the contaminant.

81-0008. van der Schalie, W. H. (Med. Bioeng. Res. & Dev. Lab., US Army, Fort Detrick, Frederick, MD 21701) **A new technique for automatic monitoring of fish ventilatory patterns and its possible use in screening tests for chronic toxicity.** *ASTM STP 707:* pp. 233-242; 1980 (10 references).

A new technique for screening compounds for toxicity, using fish ventilatory patterns, is described. A computerized system, that records and analyzes ventilatory data from the blue-gill, was used for evaluation of 1174 min of data from 22 fish exposed to toxicants. The results were 0.7% below opercular rate values and 39% below coughing rate values determined by the previous manual methods. The computer detected 25% less movement than was seen visually. Whole body movements were present in 0.4% of the data. It is suggested that even with these error rates, the system can be useful as long as each fish is evaluated for all parameters throughout the experiment. While expensive, this method is less time-consuming than manual or visual examinations.

81-0009. Allen, G. E.; Bath, J. E. (Dep. Entomol. & Nematol., Univ. Florida, Gainesville, FL 32611) **The conceptual and institutional aspects of integrated pest management.** *BioScience* 30(10): 659-664; 1980 (22 references).

Integrated pest management (IPM) is discussed as a matrix of both horizontal and vertical components. Diverse views of IPM and the nature of IPM are considered. Several management sites (representing horizontal integration) and several pest subjects (vertical integration) can be combined rather than considered as separate problems. Furthermore, a series of additional variables such as monitoring, modeling and delivery systems, can be integrated into the complete system. It is concluded that integrating of disciplines will be necessary for this concept to work. The role of law and various regulatory agencies in implementing IPM is discussed.

81-0010. Fry, W. E.; Thurston, H. D. (Dep. Plant Pathol., Cornell Univ., Ithaca, NY 14853) **The relationship of plant pathology to integrated pest management.** *BioScience* 30(10): 665-669; 1980 (13 references).

Conventional approaches to plant disease control are discussed and compared to approaches stimulated by integrated pest management (IPM). Some characteristics of plant pathogens are discussed; the organisms responsible for potato late blight, Dutch elm disease, and corn leaf blight are mentioned. Conventional control methods (activities that prevent entry of a pathogen into a crop), attempts to eliminate pathogens from plants, protection activities, and the development of plant resistance to diseases, are described. These methods are compared with the impact of IPM, which emphasizes the entire ecosystem and aims at using pesticides only when and where they are needed. One aspect of this method is the forecasting of disease occurrence (based on weather and other criteria) and the use of pesticides only when conditions indicate the need. IPM has also led to the further development of biological control, cultural techniques to suppress pathogen activity, and plant resistance.

81-0011. Bird, G. W.; Thomason, I. J. (Dep. Entomol., Coll. Agric. & Nat. Res., Michigan State Univ., East Lansing, MI 48824) **Integrated pest management: the role of nematology.** *BioScience* 30(10): 670-674; 1980 (14 references).

The role of plant parasitic nematodes in integrated pest management (IPM), a system which attempts to include all plant protection disciplines, is discussed. It is estimated that approximately 10% of the annual United States agricultural crop potential is lost due to nematodes. Factors that make control difficult include their microscopic size and inconspicuous nature, their frequent lack of characteristic symptoms on host plants, and their resistance to desiccation and other environmental stress. In addition to being plant pathogens, these plant parasitic nematodes can function as predisposition agents and vectors of plant viruses. Areas of nematode research are discussed, but it is noted that there is a need for study of nematode host-parasitic relationships and phytopathogenesis. A focal point of plant nematology research is the development of nematode management strategies for IPM, including regulatory, cultural, chemical and plant resistance components. Nematodes have many natural enemies, and research interest is increasing in the field of biological control. It is concluded that there is a strong need for research in all areas of nematology interfacing with IPM.

81-0012. Baldwin, F. L.; Santelmann, P. W. (Pest Manage. Sect., Coop. Ext. Serv., Univ. Arkansas, Little Rock, AR 72203) **Weed science in integrated pest**

management. *BioScience* 30(10): 675-678; 1980 (8 references).

The role of weed science in an integrated pest management (IPM) program is discussed. The need for weed control and a historical review of weed control methods are presented. In addition to chemical control, weeds can be at least partially controlled by biological, mechanical and cultural procedures, such as environmental manipulation, crop competition, and improved cultural management. It is pointed out that weed management also interacts with other pest control programs. While some aspects of weed science can be included in current IPM programs, the present knowledge base in weed science is inadequate for effective development of total IPM systems. Among the management techniques now in use are field monitoring to determine what weed species are expected to develop in a given field, the effectiveness of herbicide applications, and the possible need for further control methods. The effects IPM systems might have on herbicide usage, nonchemical control methods, and multiple control practices are also discussed.

81-0013. Barfield, C. S.; Stimac, J. L. (Dep. Entomol. & Nematol., Inst. Food & Agric. Sci., Univ. Florida, Gainesville, FL 32611) **Pest management: an entomological perspective.** *BioScience* 30(10): 683-689; 1980 (55 references).

A discussion of some of the basic concepts of integrated pest management is presented. There are 3 methods that have been used. The first is taking no action when there is not enough information available to act. Second, suppression, by the use of either pesticides, parasites or microbials, along with mass rearing and release of predators or parasites of insects such as the release of the parasitic wasp against the cotton bollworm. Viruses, fungi, bacteria and protozoa are 4 types of microbials that have been used in suppression. The third method is prevention action. This method is essentially preplanned suppression action. Most techniques involve non-pesticide methods such as use of resistant plants, manipulating crop planting dates, tillage, row spacing and natural control factors, such as described for suppression action. It is suggested that these 3 methods are generally not sufficient. Proper management will require a restructuring of management along interdisciplinary lines, development of a model of multiple stresses, and utilization of basic ecological information. Recommendations for implementing these philosophies include less specialized, more interdisciplinary training and instilling in the growers confidence in the techniques.

81-0014. Haynes, D. L.; Tummala, R. L.; Ellis, T. L. (Dep. Entomol., Michigan State Univ., East Lansing, MI 48824) **Ecosystem management for pest control.** *BioScience* 30(10): 690-696; 1980 (57 references).

Several approaches to the use of ecosystem management in pest control are described. Work in this area must involve teams of scientists from several disciplines, due to the interdisciplinary nature of ecosystems. The use of modelling to study this area is discussed, and its it pointed out that the onion pest-crop agroecosystem can serve as an excellent prototype system. This system is used to illustrate some of the problems of chemical pest control; 3 typical farm types (using high, moderate and low energy expenditures) are discussed. In addition, a figure is presented which shows the levels of interactions between this ecosystem and the surrounding environment. This approach enables workers to be realistic about those aspects which they wish to manage and those aspects to which they want their control strategies to be responsive. The second step is to identity the variables that affect the ecosystem. The control of some of these variables is discussed in relation to pest management.

81-0015. Edens, T. C.; Koening, H. E. (Resour. Dev. & Entomol., Michigan State Univ., East Lansing, MI 48824) **Agroecosystem management in a resource-limited world.** *BioScience* 30(10): 697-701; 1980 (5 references).

The effects of shortages and rising costs of energy on agricultural management are discussed, with the role of agroecosystem integrated management (AIM) including integrated pest management (IPM) being emphasized. The factors to be considered in agricultural management planning include cost of energy relative to labor; land; and other economic factors. It is suggested that the expense and efficacy of pesticides and energy-intensive practices will result in more efficient energy usage and an expansion of labor input, with IPM becoming more important. Regionally designed production systems are discussed, and it is pointed out that the structure of regional food/energy systems can become a major component of the pest control strategy. The use of chemical controls can be reduced or eliminated without economically significant damage by utilizing proven crop rotations, interplantings, and regional diversification of plant species and insect habitats. It is pointed out that the ramifications of this policy are not fully known, and that risk-limiting programs may have to be implemented along with biological control strategies to ensure against economic catastrophe to the grower.

81-0016. Dal Piccolo, C. R.; Matsuoka, S.; Masuda, Y. (IAA/Planalsucar, Araras-SP, Brazil) **Translocacao do herbicida Roundup pelo tolete de cana-de-acucar e sintomas colaterais causados. [Translocation of the herbicide Roundup by the seedpiece of sugar cane and its collateral effects.]** *Bras. Acucareiro* 95(4): 22-29; 1980 (5 references) (Portuguese).

Studies of the herbicide Roundup (glyphosate) show that translocation from plant to plant occurs through a common seedpiece. Up to 10% of the Roundup was

translocated, even when applied 90 days after planting. The translocated dose was sufficient to kill or damage plants not directly treated. The translocation occurred through at least five seedpiece internodes. The severity of the damage to plants was a function of the size and vigor of the plant and was independent of age.

81-0017. Wybieralska, A.; Markiewicz, E. (Dep. Biochem., Inst. Chem. & Pres., Acad. Agric., PL-71434 Szczecin, Poland) **Zawartpsc aminokwasow w ziarnie pszenicy traktowanej herbicydami. [Aminoacid content in winter wheat grain treated with herbicides.]** *Bromatol. Chem. Toksykol.* 13(1): 7-13; 1980 (8 references) (Polish).

The effect of herbicides (triazine, urea and phenoxyaceticc acid derivatives) on two winter wheat grain varieties as indicated by their total nitrogen, aminoacid and ash content was studied. Total nitrogen content was determined by the Kjeldahl method, and the aminoacid content by hydrolysis. The test data permit only a determination of the final effect of herbicide treatment as a result of metabolism of the plants. However, the influence of the climatic and the soil conditions makes interpretation difficult. Changes in the total nitrogen content and in the aminoacid content were observed; but the ash content was not significantly changed. The content of 15 aminoacids decreased in grains treated with a majority of tested herbicides. This effects of biological value of the grain. In addition, changes in some exogenic aminoacids were also found differing with particular groups of herbicides and variety of grain.

81-0018. Szymczak, J.; Grajeta, H. (Dep. Bromatol., Inst. Bioanal. & Environ. Anal., Acad. Med., PL-50140 Wroclaw, Poland) **Wplyw herbicydow stosowanych w uprawe pszenicy na zawartosc lipidow w ziarnie. [Effect of herbicides used in wheat cultivation on lipid content in the grain.]** *Bromatol. Chem. Toksykol.* 13(2): 135-138; 1980 (10 references) (Polish).

The effect of 13 herbicides, applied in the cultivation of 8 varieties of wheat, on total lipid content, phytosterols and fatty acids in grains was studied. The influence of genetic factors, climate and soil conditions on the quantity, quality and composition of lipids in wheat grain, as well as different effects of herbicides on different varieties of cultivated plans were taken into consideration. Applied herbicides did not cause considerable changes in the total content of lipids and fatty acids nor in the quantitative ratio between particular acids. The differences in fatty acids were in range of ±12%. A significant increase of phytosterols (up to 25%) due to the herbicide treatment was observed. The results of differences in the total content of fatty acids, phytosterols and lipids depended on the wheat variety.

81-0019. Szymczak, J.; Biernat, J. (Dep. Bromatol., Inst. Bioanal. & Environ. Anal., Acad. Med., PL-50140 Wroclaw, Poland) **Wplyw herbicydow na zawartosc wapnia i zelaza w ziarnie roznych odmian pszenicy. [Effect of herbicides on calcium and iron content in seeds of different wheat varieties.]** *Bromatol. Chem. Toksykol.* 13(2): 139-143; 1980 (13 references) (Polish).

The effect of herbicides (urea, triazine and phenoxyacetic acid derivatives) commonly used in agriculture on calcium and iron content in the grain of 8 winter wheat varieties obtained from experimental fields, was tested. Considerable changes in calcium and iron content were found in 5 out of 8 varieties. These changes varied for particular variety and for the type of herbicide applied; however, in some varieties they had the same characteristics independent on the type of herbicide used. Iron content decreased by as much as 40% for Tadorna variety, while for Mironowskaja variety the iron content increased by maximum of 30%. Changes in iron content indicate an herbicide interference in some stages of photosynthesis, in plant respiration and in the electron transport system. Considerable changes in calcium content were also observed; a decrease of > 30% for the Alcedo variety and an increase of 30% in the Tadorna variety. A decrease in calcium content due to the herbicide application can be caused by the effect of these compounds on calcium sorption from the soil by plants during early stages of development. These 1-yr experiments are not sufficient to permit complete evaluation of the herbicide effects on nutrient composition of the tested grains, but the decrease of calcium and iron is suggested to be a cause for concern.

81-0020. Thaler, G. R.; Plowright, R. C. (Dep. Bot., Erindale Coll., Univ. Toronto, Toronto, M5S 1A1 Ontario, Canada) **The effect of aerial insecticide spraying for spruce budworm control on the fecundity of entomophilous plants in New Brunswick.** *Can. J. Bot.* 58(18): 2022-2027; 1980 (10 references).

Studies were performed to investigate the relationship between insecticide spraying for spruce budworm control and the fecundity of entomophilous plants. Five forest plants were assessed for dependence on insect visitation. In 1977, samples were taken from a variety of areas with differing insecticide spray histories. In 1978, a 4 km × 8 km block was sprayed with fenitrothion. Samples were taken from sprayed and nonsprayed areas. Samples from both studies consisted of selected plant types which were assessed for seed production. The results of the 1977 study indicated that all study species from areas sprayed with fenitrothion had reduced fecundity. The ratio of this difference ranged from 1:4.6 to 1:1.53. The 1978 study demonstrated considerable variation in fecundity with respect to the spray. For each plant there was some depression of fecundity in samples drawn from spray areas. The importance of sample size for assessing insecticide damage is discussed.

81-0021. Francis, T. R.; Hamill, A. S. (Res. Stn., Agric. Canada, Harrow, Ontario NOR 1GO, Canada) **Inheritance of maize seedling tolerance to alachlor.** *Can. J. Plant. Sci.* 60(3): 1045-1047; 1980 (6 references).

The inheritance of seedling tolerance to the herbicide alachlor [2-chloro-2′6′-diethyl-*N*-(methoxymethyl)] was studied in a greenhouse using inbreds and hybrids of maize. Only non-additive gene effects were significant. Thus, reliable prediction of hybrid tolerance from knowledge of inbred response is not possible. (Author abstract by permission)

81-0022. Wicks, J. (Author address not given) **Hoechst rejects Rhine pollution allegations.** *Chem. Age (London)* 121(3186): 4; 1980.

Hoechst chemical wastes, including endosulfan and other organochlorine hydrocarbons of low degradability, have been cited as contributing to the pollution of the Rhine and Main rivers. However, officials from Hoechst state that the Frankfurt plant has been operating a chemical-biological waste treatment unit since 1967, which was substantially expanded in 1977. In 1979 the portion of pollution in the Main which could be attributed to organic polluton from Hoechst's treatment facilities was 27%. Similar studies of the Rhine showed that the Hoechst plant was responsible for 3-4% of the pollution there. Hoechst claims that endosulfan released from Griesheim is below permitted limits, and that the levels present are harmless to humans.

81-0023. Younis, H. M.; Mohanty, P. (Dep. Bot., Univ. Illinois, Urbana, IL 61801) **Inhibition of electron flow and energy transduction in isolated spinach chloroplasts by the herbicide dinoseb.** *Chem. Biol. Interact.* 32(1-2): 179-186; 1980 (22 references).

Class II chloroplasts isolated from young leaves of spinach were used in studies to determine the mode of action of dinoseb (2-sec-butyl-4-6- dinitrophenol) on chloroplast reactions. The effects of various concentrations of dinoseb (0-40 μM) on ferricyanide photoreduction was measured spectrophotometrically. Photoreduction was inhibited by dinoseb in a dose-dependent fashion. In addition, cyclic and non-cyclic photophosphorylation and Mg^{2+}-ATPase activity, and electron flow from water or from an artificial electron donor are inhibited by dinoseb. Dinoseb stimulated Ca^{2+}-ATPase activity of solubilized heat-activated chloroplast coupling factor I (CF_1). The results indicate that dinoseb acts by inhibiting energy transduction in chloroplasts. Two different biochemical lesions are known to occur, one in the oxidation chain and one in the energy coupling system.

81-0024. Anonymous **Risk assessment's role in regulation debated.** *Chem. Eng. News* 58(42): 30-31; 1980.

Views concerning the problem of risk assessment in dealing with chemicals were presented at the sixth Symposium on Statistics and the Environment, sponsored by the National Research Council of the National Academy of Sciences. Most of the problems were found not in data collection, but rather in interpretation of data already collected. Topics discussed at the symposium included benzene regulations, diethylstilbestrol, the use of the herbicide 2,4,5-T, and chlorofluorocarbons.

81-0025. Martin, R. A. (Univ. Guelph, Guelph, Ontario, Canada) **Fungitoxic and systemic activity of the fungicide fenapanil.** *Diss. Abstr. Int. B* 41(4): 1184-1185; 1980.

The structure-activity relationships of fenapanil (RH-2161) and closely related analogs were tested *in vitro* against a broad range of fungi. Phytotoxicity and systemic activity were also evaluated. Substitutions to the phenyl ring increased both fungitoxicity and phytotoxicity of fenapanil. The presence of a cyano group on the asymmetric carbon also increased fenapanil's fungitoxicity. It appeared that phenyl substitutions at the ortho position may increase to a limited extent the stability of the molecule, based on changes in fungitoxicity over time. All of the compounds exhibited systemic activity, which in barley was limited to apoplastic translocation. In soybean and cucumber fenapanil demonstrated limited symplastic translocation. Weak cellular binding or partitioning of lipophilic xenobiotics into lipid components of the cell may be used to illustrate the necessity of modifying the intermediate diffusion hypothesis for phloem loading. The comparison of fenapanil and fenarimol uptake and transport in various plants, and uptake and efflux from potato tuber tissue indicated the role which cellular retention may play in dictating systemic activity. Fenarimol had a greater octanol/water partition coefficient than fenapanil. It was also concentrated and symplastically transported to a greater extent than was fenapanil. By being retained within the tissue overall diffusion was more in the symplast than apoplast. A general diffusion theory would account for systemic transport of many systemic xenobiotics. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms)

81-0026. Mussgnug, G. L. (Montana State Univ., Bozeman, MT) **Integration of *Nosema locustae* with chemical insecticides and entomopoxvirus for control of grasshoppers.** *Diss. Abstr. Int. B* 41(4): 1233; 1980.

The effects in grasshoppers of the protozoan, *Nosema locustae*, and formulations of *N. locustae* with the insecticides malathion and carbaryl, or with an entomovirus, the grasshopper inclusion body virus (GIBV), were investigated during 1976, 1977 and 1978. *N. locustae* primarily infects the fat body of the grasshopper and

results in reduced vigor and eventually death. A logarithmic relationship between the dosage of *N. locustae* used for initiating infection and the mortality and incidence of infection was demonstrated. Infection by *N. locustae* may increase the toxicity of malathion when fed orally to some species of grasshoppers in the laboratory but evidence of a stress phenomenon induced by the pathogen could not be demonstrated in field tests. Mid-season spraying with ULV malathion to prevent oviposition might not disrupt an epizootic of *N. locustae* initiated earlier in the season. Third-instar grasshoppers fed oral doses of malathion or carbaryl died within 24 hr while GIBV and *N. locustae* acted slower. Combinations of *N. locustae* with malathion, carbaryl or GIBV were non-antagonistic and additive in action in laboratory assays. Formulations of malathion-*N. locustae* on bran rapidly reduced densities of grasshoppers and produced infection in the residual population. Reduction in density of 25-50% occurred within 3-5 days after malathion was applied as a 0.4% bran bait either alone or in combination with *N. locustae*. Grasshopper populations treated with formulations of malathion-*N. locustae* displayed lower infection rates than when the pathogen was applied by itself. Slowing the spread of infection by simultaneously applying malathion with *N. locustae* was considered only temporary. The benefits of using an integrated approach for managing grasshopper populations on rangeland are discussed. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8023226)

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81-0027. Barrons, K. C. (Author address not given) **Illuminating some obfuscation about pesticide safety.** *Farm Chem.* 143(10): 54-55; 1980 (6 references).

Statements made concerning the extent and number of mortalities recorded in any given year due to pesticide exposure are criticized for often being incorrect and contradicting. A statement contained in another report that 200 individuals/yr die from pesticide exposure is discussed. The author contends that this figure should be closer to 35/yr. No instances of human cancer have been associated with the approved use of any pesticide. Only those new pesticides found to be free from tumor-inducing effects have been commercialized, and various older pesticides have been removed from the market when any evidence of carcinogenicity has been determined. The cancer risk from pesticides is considered to be very low, particularly when the safety measures associated with pesticide use are also considered.

81-0028. Blalock, L. W.; Sullivan, R. I.; Downing, J. (Author address not given) **It's the law ... maybe.** *Farm Chem.* 143(10): 80-80; 1980.

These letters to the editor expresses concern over an earlier mis-statement of the law concerning pesticide applicators. In Nevada there are 2 separate programs for pesticide applicators. The first deals with custom applications of pesticides by professionals. The second program concerns persons applying restricted pesticides, which requires a special permit. Differences in the fees, duties and legal responsibility of these 2 groups are discussed. Colorado has an examination and licensing law which regulates only commercial applicators. The certification program is not EPA approved, and applicators must comply with both EPA and state requirements. In Florida the Division of Health is responsible for registration of pest control operators, and lawn and ornamental applicators. Other applicators must be certified by the Department of Agriculture.

81-0029. Dabi, R. K.; Gupta, H. C.; Sharma, S. K. (Agric. Res. Stn., Durgapura, Jaipur, Rajasthan 302004, India) **Bio-efficacy of *Bacillus thuringiensis* Berliner against *Euproctis lunata* Walker on pearlmillet.** *Indian J. Agric. Sci.* 50(4): 356-358; 1980 (8 references).

A biological method for the control of *Euproctis lunata* on pearlmillet was examined. Six concentrations (ranging from 1.12 to 17.92 × 10^9 IU/ha) of Dipel (HD-1 strain of *Bacillus thuringiensis* Berliner) were applied to 5 × 2 m plots having dense populations of the host plant. After 2 hr, treated leaves were removed and placed in petri dishes, each containing third or fifth instar larvae. Mortality was observed after 24, 48, 72 and 96 hr. Mortality was found to be proportional to the concentration of Dipel, with third instar larvae always more susceptible than fifth instar. A concentration of 4.48 × 10^9 IU gave less than 50% kill of the third instar larvae after 96 hr, and 8.96 × 10^9 IU gave less than 50% kill of fifth instar. It was found that the highest concentration, which is equivalent to 1120 g/ha, was most effective, giving more than 80% kill after 96 hr. Results on the use of *B. thuringiensis* to control different pests are discussed.

81-0030. Subrahmanyam, B.; Rao, P. J.; Tiwari, L. D. (Div. Entomol., Indian Agric. Res. Inst., New Dehli 110012, India) **Juvenomimetic effects of diflubenzuron on *Achdea janata* Linn.** *Indian J. Exp. Biol.* 18(3): 324-325; 1980 (9 references).

The juvenomimetic effects of the insecticide diflubenzuron, an inhibitor of chitin synthesis, were examined in the castor semilooper, *Achaea janata*. Fourth instar larvae were fed overnight on castor leaves sprayed with 0.1-100 ppm diflubenzuron. They were subsequently reared on untreated food, and disturbances at larval molt, pupation and adult emergence were observed. Of the larvae treated with 10 or 100 ppm, none reached the adult stage, while among those treated with the lower concentrations, adult emergence was about 12%. The effects of diflubenzuron included retention of larval structures (especially larval head and thoracic legs) in pupae, incomplete tanning of cuticle following abortive pupation, and prolapse of rec-

tum in the last instar. Some possible mechanisms of these juvenomimetic effects are discussed.

81-0031. Nair, M. N. B.; Patel, K. R.; Shah, J. J.; Pandalai, R. C. (Dep. Biosci., Sardar Patel Univ., Vallabh Vidyanagar 388120, India) **Effect of ethephon (2-chloroethylphosphonic acid) on gummosis in the bark of *Azadirachta indica*.** *Indian J. Exp. Biol.* 18(5): 500-503; 1980 (21 references).

The effect of ethephon (2-chloroethylphosphonic acid) administration on the extent of gum exudation and histological and histochemical changes in the bark of *Azadirachta indica* was studied. Ethephon was applied at concentrations of 4.8, 7.2, 9.6 and 12.0 mg. The chemical was injected in holes made by an increment borer in the trunk of the trees. Administration of the chemical caused a 100% increase in gum production. Starch grains in the cells of wound tissue of ethephon treated plants completely disappeared. Extensive breakdown of cell walls was noted at the application site and mass dissolution of cells was noted. The gum production appeared to be aided by the degradation products of starch grains and cell wall. Increases in lipid and polyphenolic compounds were noted in cells slightly removed from the application site. Various enzymes such as peroxidase, acid phosphatase and succinate dehydrogenase were stimulation in the cells slightly removed from injection.

81-0032. Rizvi, S. J. H.; Mukerji, D.; Mathur, S. N. (Lab. Plant Physiol., Bot. Dep., Univ. Gorakhpur, Gorakhpur 273001, India) **A new report on a possible source of natural herbicide.** *Indian J. Exp. Biol.* 18(7): 777-778; 1980 (5 references).

Extracts of leaves and seeds from various plants were tested for their herbicidal properties. The most potent extract was selected for further study. The seed extract of *Coffea arabica* was tested against the test weed, *Amaranthus spinosus*. The extract was fractionated in different organic solvents with the fractions then being tested for the desired activity. Seed germination of the test weed was completely inhibited by 5000 ppm of the chloroform fraction. No effect on the germination and subsequent growth of *Phaseolus mungo* was observed. It is suggested that further testing be done on this natural herbicide.

81-0033. Leavitt, J. R. C.; Penner, D. (Pestic. Res. Cent., Dep. Crop & Soil Sci., Michigan State Univ., East Lansing, MI 48824) ***In vitro* conjugation of glutathione and other thiols with acetanilide herbicides and EPTC sulfoxide and the action of the herbicide antidote R-25788.** *J. Agric. Food Chem.* 27(3): 533-536; 1979 (20 references).

Nonenzymatic reaction *in vitro* of ^{3}H-labeled glutathione (GSH) with [^{14}C]alachlor, [^{14}C]metolachlor, [^{14}C]H-22234, and [^{14}C]EPTC sulfoxide formed dual-labeled GSH-herbicide conjugates. GSH did not conjugate in this system with the herbicides buthidazole, atrazine, EPTC, or the herbicide antidote R-25788. Alachlor also conjugated with the thiol-containing compounds cysteine, dithiothreitol, and coenzyme A but not with methionine, acetyl-CoA, mercaptoethanol, or ethanethiol. The alachlor-GSH conjugation reaction yielded more product with increased pH (over pH 6.0), indicating that *in vitro* reactions proceed by way of the GS^{-} ion. Although the GSH-acetanilide conjugation reaction had a low yield at physiological pH, it could be the basis for the protection of corn from acetanilide herbicide injury by R-25788. It is suggested that R-25788 may protect corn from EPTC injury by increasing the rate of EPTC sulfoxidation, followed by subsequent EPTC sulfoxide-GHS conjugation. (Author abstract reprinted by permission of the American Chemical Society)

81-0034. Shimabukuro, R. H.; Walsh, W. C.; Hoerauf, R. A. (Metab. & Radiat. Res. Lab., Fargo, ND 58105) **Metabolism and selectivity of diclofop-methyl in wild oat and wheat.** *J. Agric. Food Chem.* 27(3): 615-623; 1979 (23 references).

Diclofop-methyl (methyl 2-[4-(2′,4′-dichlorophenoxy)phenoxy]propanoate) was hydrolyzed rapidly to diclofop (2-[4-(2′,4′-dichlorophenoxy)phenoxy]propionic acid) in resistant wheat and susceptible wild oat. Neither compound accumulated in the tissues of either species. The major reactions in wheat are the oxygenation of the 2,4-dichlorophenyl moiety of diclofop, followed by conjugation to an acidic aryl glycoside. In wild oat, diclofop was conjugated as a neutral glycosyl ester. The sugar moiety has not been characterized positively in either conjugate. Only limited symplastic and apoplastic translocation of diclofop-methyl and its metabolites occurred in wheat and wild oat. Herbicide selectivity between wheat and wild oat may be a function of its placement on the plant and the rate of herbicide metabolism, but the ability of wheat to irreversibly detoxify the herbicide by aryl hydroxylation may be the primary selective factor. (Author abstract reprinted by permission of the American Chemical Society)

81-0035. Kalmaz, E. V. (Univ. Tennessee, Knoxville, TN) **Toxicity and ecological significance of trace elements in aquatic environments.** *J. Environ. Sci.* 23(5): 24-27; 1980 (25 references).

Pesticide application has led to global pollution by persistent trace elements such as lead, mercury, cadmium and barium. Most of these trace elements enter the hydrosphere and are associated with sludge or sediment on the bottoms of rivers, lakes and other water bodies. Several pollution control laws have been written in response to increased concern about environmental contamination. Adverse health effects caused by these trace elements in the

atmosphere are slowly being documented. Correlations have been noted between infant mortality and water hardness. Negative correlations were found between cardiovascular mortality and trace element concentrations for several elements. Water hardness appears to be directly related to trace elements. Mortality, various types of cancer, and trace element concentrations in drinking water seem closely associated. Concentrations may be magnified through bioaccumulation, causing higher concentrations in predatory animals than in other organisms or in the general environment. The interaction of the trace elements with organic matter is considered along with the transport, distribution and adsorption mechanisms involved.

81-0036. Taylor, J. H.; Jackson, C.; Miller, M.; Rushneck, D. R. (PJB Lab., Jacob Eng., Pasadena, CA 91105) **Laboratory management in methods development.** *J. Environ. Sci. Health A* 15(5): 393-411; 1980 (2 references).

Management techniques to deal with operations in an analytical laboratory are reviewed. A description is given of the organizational structure needed to operate a lab which handles both methods development and routine analyses (including organic pesticide extraction and analysis). Flow sheets, work order forms and status sheets which would be needed for such an organization are described. Precepts for management in the methods development section, and how they should be implemented, are discussed.

81-0037. Abelentsev, V. I.; Savchenko, V. I. (All-Union Res. Inst. Chem. Means Plant Prot., Moscow, USSR) **Rezistentnost' vozbuditelya muchnistoi rosy ogurtsov k benzimidazol'nym fungitsidam. [Resistance of pathogen of powdery mildew of cucumbers to benzimidazol fungicides.]** *Khim. Sel'sk. Khoz.* 18(9): 31-33; 1980 (21 references) (Russian).

Development of resistance to the benzimidazol fungicide benomyl was studied in the pathogen of cucumbers powdery mildew *(Erysiphe cichoracearum).* It was found that the sensitive strain was equally sensitive to benomyl, Benacil, BMC and phenaciozol. Resistant strains retained their resistance (in the absence of the contact with benomyl) for 3 mo. Strains resistant to benomyl did not show cross-resistance to benzimidazol derivatives.

81-0038. Rose, J. D. R. (Llandough Hospital, Penarth, Glamorgan CF6 1XX, Wales) **Paraquat poisoning.** *Lancet* 2(8200): 924; 1980.

A case is presented of a 39-yr-old man who consumed approximately 50 ml of diluted Gramoxone (paraquat) in a suicide attempt. Symptoms included dyspnea, an elevated urea (24 mmol/l), and creatinine (560 μmol/l), proteinurea, and hyaline casts in the urine. It is pointed out that this paraquat level (0.133 mg/l in plasma at 6 days) is generally considered to be fatal. The patient showed increasing renal failure, falling forced vital capacity, and extensive perihilar opacities, but these conditions gradually improved. It is suggested that active treatment be given to all paraquat poisoning cases, even those known to have received usually fatal paraquat doses.

81-0039. Brown, A. W. A. (Michigan State Univ., East Lansing, MI 48824) **What have insecticides done for us?** *Mosq. News* 40(3): 333-338; 1980 (4 references).

The history of insecticidal control of various insect-borne diseases is reviewed. The use of DDT to control mosquitoes on the shores of Hudson's Bay during World War II is discussed. Annual spraying of all northern defense bases continued for the following 20 yr with no development of DDT-resistance among the *Aedes* mosquitoes and no residues of the chemical in the food-chains. At lower latitudes resistance to DDT did develop in the salt-marsh *Aedes* of Cocoa Beach, Florida. In California parathion and malathion were substituted as larvicides. DDT has proved effective and inexpensive to use for controlling the spread of malaria throughout the world. Resistance to DDT did develop in Central America, and it was replaced by the carbamate propoxur (Baygon). Possible use of the pyrethroids permethrin and decamethrin is now being investigated. Control of filariasis proved less successful than malaria. Biological control agents are now being emphasized. For onchocerciasis control spraying the streams which contain the larvae has been somewhat successful. The chemical control of yellow fever is also mentioned.

81-0040. Wickremesinghe, R. S. B.; Mendis, C. L. (Med. Res. Inst., Colombo, Sri Lanka) ***Bacillus sphaericus* spore from Sri Lanka demonstrating rapid larvicidal activity on *Culex quinquefasciatus.*** *Mosq. News* 40(3): 387-389; 1980 (7 references).

Nine aerobic spore-bearing bacilli were isolated from coconut husk pits in Sri Lanka. The effect of the bacilli was studied on larvae from eggs obtained from field collected females of *Culex quinquefasciatus.* One of the bacilli, MR 4 (a strain of *Bacillus sphaericus*), demonstrated marked larvicidal activity. The lowest dosage (1×10^3 organisms/ml) killed most exposed larvae. Unusual features of the bacillus were that it contained a parasporal body contiguous with the spore and was of a serotype that had not been previously recorded.

81-0041. Sollers-Riedel, H. (P.O. Box 19009, Washington, DC 20036) **Literature references to mosquitoes and mosquito-borne diseases. 1980 – part III.** *Mosq. News* 40(3): 479-499; 1980 (476 references).

A list of 476 literature references to mosquitoes and mosquito-borne diseases is presented. Sections of the paper include aldulticides, larvicides and ovicides (13 references); growth regulators (5 references); integrated pest management (1 reference); water management (19 references); mosquito control agency problems (7 references); parasites, predators, viruses and related agents (33 references); equipment (3 references); attractants and repellents (3 references); resistance and susceptibility (5 references); pesticides and chemicals (10 references); toxicology (2 references); behavior, biology and ecology (35 references); genetics and genetic control (17 references); anatomy, morphology and physiology (9 references); techniques (11 references); taxonomy (9 references); distribution (11 references); arboviruses and other vertebrate viruses (79 references); filariasis (36 references); malaria (132 references); experimental hosts or vectors (4 references); allergic reactions (2 references); light and other trap studies (4 references); literature references and reviews (4 references); biography and history (7 references); subjects not covered by other headings (2 references); booklets and reports (5 references); and books (9 references).

81-0042. Weir, D.; Schapiro, M. (Cent. Invest. Rep., Oakland, CA) **The circle of poison.** *Nation* 231(16): 497, 514-516; 1980.

The heavy use of pesticides in third world countries is described. The argument that the extensive use of pesticides is required to feed the hungry people of the world is presented. It is suggested that the food is usually exported. The hungry people in these countries do not benefit nutritionally or financially. Protective devices are not used during pesticide application. The pesticides used include some banned for use in the United States. It is also suggested that the people in the third world nations are not the only victims. Much of their food which is exported has been shown to contain pesticide residues. However, tests on imported products are usually not completed until the products have already been distributed and consumed.

81-0043. Piccardi, P.; Massardo, P.; Bettarini, F.; Longoni, A. (Ist. Rec. G. Donegani, Montedison S. p. A., I-28100 Novara, Italy) **New chlorinated juvenile hormone analogues and their biological activity.** *Pestic. Sci.* 11(4): 423-431; 1980 (25 references).

In the search for new juvenile hormone analogs (JHAs), a general approach was chosen based on the substitution of the isoprene unit that carries the epoxy function in the natural hormone JHIII, by 3,3,3-trichloropropyl, 2,2-dichlorocyclopropylmethyl, 3,3-dichloroallyl, or 3-chloroprop-2- ynylmethyl, 3,3-dichloroallyl, or 3-chloroprop-2-ynyl groups. Accordingly, several terpenoid aromatic JHAs were prepared with, or without, oxygen atoms in the aliphatic chain. Structure-biological activity relationships of the most active compounds toward the yellow mealworm *(Tenebrio molitor)* and the large cabbage white butterfly *(Pieris brassicae)* are given. With a view to preparing synthetically accessible analogs, some alkyl phenyl ethers were also made which were not branched in the aliphatic chain and were related terminally to the most active compounds. They were only moderately active against insects when tested for morphogenetic activity, but exhibited good field persistence. The occurrence of a moderate acaricidal activity among these analogs prompted the examination of several 1,4-disubstituted- phenyl derivatives. The ovicidal effectiveness of these products against a susceptible strain of the two-spotted spider mite, *Tetranychus urticae*, was 10 or 100 times higher than that of the well know and highly potent JHAs. (Author abstract by permission)

81-0044. Geissler, A. E.; Huppatz, J. L.; Phillips, J. N. (Div. Plant Ind., CSIRO, Canberra, ACT 2601, Australia) **The herbicidal activity of 2-alkyl-2-cyanoacetanilides.** *Pestic. Sci.* 11(4): 432-438; 1980 (9 references).

The pre-emergent herbicidal activity of 2-alkyl-2-cyanoacetanilide derivatives (a new class of anilide herbicides) is reported and the relationship between structure and activity examined. The compounds appear to act by inhibiting development of root growth. Comparisons with 2-chloroacetanilide herbicides reveal similarities and differences which suggest that, while both groups may interact at a similar cellular site, a different reaction mechanism may be involved. (Author abstract by permission)

81-0045. Harris, R. L. N.; Huppatz, J. L.; Teitei, T. (Div. Plant Ind., CSIRO, Canberra, ACT 2601, Australia) **The effect of *C*-2-carboxyphenyl derivatives of certain heterocyclic compounds on root geotropism in cress seedlings.** *Pestic. Sci.* 11(4): 439-444; 1980 (10 references).

The effects on root geotropism of 2-carboxyphenyl derivatives of various five- and six-membered heterocyclic compounds have been assessed. In an assay involving cress seedlings, appropriately substituted derivatives of isoxazole, 1,3,4- and 1,2,4-oxadiazoles, 1,3,4-thiadiazole, 1,2,4-triazole, thiazole, pyridine, pyrimidine, and pyridazine were highly effective in eliminating the geotropic response. (Author abstract by permission)

81-0046. Scarponi, L.; Tafuri, F.; Perucci, P. (Cent. Stud. Chim. Antiparassitari, CNR, I-06100 Perugia, Italy) **Effects of certain herbicides on the oxidative decarboxylation of tryptophan by peroxidase.** *Pestic. Sci.* 11(4): 446-450; 1980 (24 references).

Non-enzymic and peroxidase-catalyzed oxidative decarboxylation of tryptophan (TPP) were studied. The *in vitro* rate of enzymic reaction was affected by various herbicides at low concentrations (10^{-5}–10^{-4} *M*): dinoseb, 2,4-

D, dichlobenil and benazolin acted as inhibitors; on the other hand, chlorpropham, bromacil, diphenamid and 4-ethylamino-6-isopropylamino-1,3,5-triazin-2-ol (hydroxyatrazine) were stimulatory. The results of *in vivo* experiments showed that chlorpropham and 2,4-D changed the activity of peroxidase from *Brassica* germinated seeds *in vivo*, as they do *in vitro*. Determinations of consumed TPP were carried out either by spectrophotometry or by chromatography. (Author abstract by permission)

81-0047. Qadri, S. S. H.; Rao, B. B. (Dep. Zool., Univ. Coll., Kakaatiya Univ., Warangal 506009, A.P., India) **Effect of oleoresin in combination with neem seed and garlic clove extracts against household and stored product pests.** *Pesticides* 14(3): 11-14; 1980 (13 references).

The use of indigenous materials for the control of household and stored product pests was examined. Extracts were prepared of neem seeds, garlic cloves and chrysanthemum flowers (oleoresin). Extracts were spread alone or in combination on glass petri dishes, and 10-12 pairs of insects were exposed. The insects used in the toxicity testing were housefly *(Musca domestica)*, pulse beetle *(Callosobruchus chinensis)*, and lesser grain borer *(Rhizopertha dominica)*. Mortality counts were made after 24 hr of exposure. When tested alone, toxicities were oleoresin > garlic clove extract > neem seed extract. In combination tests, neem seed and garlic clove extracts showed synergistic action in combination with oleoresin. Oleoresin + neem seed extract was more toxic against the insects tested than oleoresin + garlic clove extract. It is suggested from these results that control of insect species by these alternative chemicals may be possible with minimum health hazards.

81-0048. Reichhart, D.; Salaun, J. P.; Benveniste, I.; Durst, F. (Lab. Physiol Veg., Univ. Louis Pasteur, F-67083 Strasbourg Cedex, France) **Time course of induction of cytochrome P-450, NADPH-cytochrome *c* reductase, and cinnamic acid hydroxylase by phenobarbital, ethanol, herbicides, and manganese in higher plant microsomes.** *Plant Physiol.* 66(4): 600-604; 1980 (27 references).

The effects of several toxicants on enzyme systems of the microsomes in higher plants was studied. Aging artichoke tuber tissue slices (1 mm thick) were incubated in the dark with the test compounds dissolved in water. During the experiment homogenates were made of the tissue and microsomal pellets were prepared. Enzyme activity of the microsomal fraction was measured. Hydroxylase activity and cytochrome P-450 content were markedly increased by 25 m*M* $MnCl_2$, 4 m*M* phenobarbitol, and 300 m*M* ethanol. Dichlobenil (200 m*M*) and monuron (200 m*M*) caused less of an increase, and Chloro-IPC (chlorpropham) caused a slight inhibiton of activity. None of the toxicants except phenobarbital caused an increase in NADPH cytochrome *c* reductase. The activity of cytochrome b_5 was less affected than any other parameter. It is concluded that more work must be conducted to determine the mechanisms by which these enzymes are altered.

81-0049. Pazderova-Vejlupkova, J.; Lukas, E.; Nemcova, M.; Pickova, J.; Jirasek, L. (Clin. Dis., Fac. Med., Charles Univ., PL-12821 Prague 2, Czechoslovakia) **Chronicka intoxikace 2,3,7,8-tetrachlorodibenzo-*p*-dioxinem. [Chronic poisoning by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.]** *Prac. Lek.* 32(6-7): 204-209; 1980 (14 references) (Czech).

The medical history of 55 men chronically exposed to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin was studied for 10 yr. Disorders in the metabolism of porphyrins, diabetes mellitus, hepatic lesions, increase of total blood proteins and globulins alpha and gamma, polyneuropathy, and some cases of encephalopathy, psychic disorders and chloracne were observed. The symptoms appeared irregularly in individual organs and systems in the first years, stabilized after 5 yr, and improved in some individuals. Two of the patients died from bronchogenic cancer, one from liver cirrhosis, and one (a severely poisoned victim) from a rapid and morphologically atypical form of atherosclerosis. Some patients still exhibit disorders of lipid metabolism. It is suggested that in most cases there was a simultaneous affection of all organs mentioned, and it is concluded that this toxin interferes with general enzyme activities of the most basic processes.

81-0050. Sharma, Y. P.; Sharma, R. A.; Vatsa, V. K. (Dep. Bot., Hindu Coll., Moradabad 244001, India) **Effects of chlorflurenol on the growth and yield of great millet *(Sorghum vulgare* Pers.).** *Sci. Cult.* 46(2): 61-62; 1980 (6 references).

The plant bioregulator chlorflurenol was used at four concentrations, 0.005, 0.01, 0.025 and 0.05%, to treat seeds of great millet, which were sown in a randomized single row design. Teepol was applied as a surfactant 2 hr before spraying. Chlorflurenol inhibited plant growth in a direct proportion to the concentration used. No effect on branching was noted at the lowest concentration. However, at the three higher levels, branching was increased by induction of lateral branches from the nodes of the main plant.

81-0051. Anonymous **Vietnam herbicide investigation.** *Search* 11(7-8): 216; 1980.

A $2 million program to determine whether Australian veterans of the Vietnam war were adversely affected by exposure to herbicides in Vietnam is announced. Three groups of veterans will be compared. The first group will be composed of Australian veterans who were in vietnam and exposed to herbicides and other significant

chemicals. The second group will be composed of Australian Vietnam veterans not exposed to herbicides, but possibly exposed to other environmental chemicals. The third group is composed of a matched and comparable group of Australian veterans who did not go to Vietnam, and have not been exposed to the herbicides or other chemicals used there. The incidences of defined illnesses, genetic defects in their offspring, birth defects in their offspring and spontaneous abortions of their wives will be compared.

81-0052. Springell, P. H.; de Souza, D. (P.O. Box 332, Alice Springs, Northern Territory 5750, Australia) **Lack of confidence in NHMRC.** *Search* 11(7-8): 223-224; 1980.

Two letters to the editor are presented which discuss the issue of public awareness and regulatory issues concerning the pesticide DBCP (dibromochloropropane). In the first letter it is suggested that the National Health and Medical Research Council of Australia (NHMRC) was slow to give warning of the dangers of this pesticide, such as reported male human sterilization. The second communication, a rebuttal of the first, lists 5 steps that the NHMRC has taken with regard to the protection of public health from the possible ill effects of DBCP. The actions culminated in the placement of DBCP on the prohibited substances list. Actions taken by the Council on the pesticide 2,4,5-T are also discussed, as are the duties on the council with regard to interactions with the government.

81-0053. Peng, S. Y. (Dir. Agric., Taiwan Sugar Res. Inst., Taiwan) **Isouron and Velpar in a new criterion for field evaluation of herbicides.** *Taiwan Sugar* 27(3): 94-99; 1980 (7 references).

Field trials on 2 herbicides used in sugar cane which employ criteria emphasizing both crop tolerance and weed control are described. In preliminary screening tests 40 treatments formed by combinations of 11 compounds were evaluated [including combinations of isouron, atrazine, diuron, 2,4-D, asulam, Velpar (hexazinone), Vel 5026 (buthidazole) and Bladex (cyanizine)]. The compounds Velpar and isouron were found to be outstanding, and were tested more extensively. Their effects were studied on cane plants produced by 4 different propagation methods: planting of top cuttings, transplanting of rayungans and pre-raised plantlets, and ratooning. At 1.0 to 2.0 kg AI/ha neither compound showed significant toxic effects on plant growth and yield of cane. The compounds were also tested under various climatic conditions (5 different localities) and soil types (loam, sandy loam, red soil). Both compounds at 2 kg AI/ha spayed preemergence achieved control of the dominant grasses with no toxicity to care seedlings or peanuts (a common intercop of sugarcane).

81-0054. Iyer, P. P.; Yates, W. E.; Akesson, N. B.; Horgan, P. M. (Agric. Eng. Dep., Indian Inst. Technol., Kharagpur, INdia) **Controlled release of gossyplure for use in control of cotton pink bollworm.** *Trans. ASAE* 23(4): 840-848; 1980 (14 references).

A non-insecticidal means for control of the pink bollworm, a major cotton pest, has been studied. The release of gossyplure, a synthetic sex pheromone, has been shown to disrupt mating. Larval control by this method was comparable to that obtained by conventional insecticidal methods. A theoretical model was developed to predict the release of gossyplure from gossyplure filled fibers sealed at one end. Development of the model is described in detail. The model predictions were experimentally verified by measuring the gossyplure release from hollow fibers placed in an environmental simulation chamber. The model has a relative error up to 13.5% due to errors in the determination of vapor pressure and diffusion. Experimental measurements to verify the predictions were found to be within 5-20% of the predicted values of gossyplure release. It is concluded that the model has been satisfactorily verified within the limits of experimental error.

81-0055. Kondrat'ev, Iu. A.; Shapovalov, A. A.; Rozhkova, N. G. (Author address not given) **Puti sozdaniya otechestvennykh khimicheskikh sredstv zashchity rastenii. [Development of Soviet chemical means of plant protection.]** *Vestn. Akad. Nauk SSSR* (7): 62-65; 1980 (4 references) (Russian).

Various aspects of the screening for and development of chemical means of plant protection in the Soviet Union are discussed. The number of chemicals subjected to the primary trials increased from 1100 in 1974 to 4500 in 1980. A special system of step-by-step testing of herbicidal, fungicidal, insectoacaricidal, and hormonal activities was created. Special emphasis is placed on the screening for herbicides and growth regulators.

81-0056. Gasztonyi, M.; Josepovits, G. (Res. Inst. Plant Prot., Budapest, Hungary) **Translocation and metabolism of triadimefon in different plant species.** *Acta Phytopathol. Acad. Sci. Hung.* 13(3-4): 403-415; 1979 (16 references).

Experiments were performed on several species of plants to characterize the translocation and metabolism of the systemic fungicide triadimefon. Homogenates were prepared from the leaves of cucumber, tomato, bean and wheat, and incubated in 100 ppm triadimefon for 1 or 24 hr. After incubation, the homogenates were filtered and the filtrates were extracted with chloroform and acetone. Translocation was examined in these same species by treating the upper leaves of plants with 2.35 mg triadimefon (except tomato, which received 0.59 mg). After 3 days, the plant parts were separated, homogenized and extracted with acetone. Samples from both experiments were analyzed by gas chromatography for the triadimefon levels and by thin layer chromatography with benzene acetone (9:1) solvent mixture. After evaporation of the solvent, the plates were tested by bioautography using *Cladosproium cucumerinum*. The loss of active material from leaf homogenates incubated with 100 ppm fungicide was greatest in cucumber (32% after 24 hr), and least in tomato (15% after 24 hr). The translocation experiments showed that 18 μg/g fungicide were found in untreated tomato parts, but only 0.5 μg/g were found in wheat and 0.6 μg/g in bean. Metabolism studies revealed the intermediate triadimenol, which is more toxic than the parent compound. However, when application of the parent compound was in aqueous solution, little or no triadimenol was formed. Differences in the activity of this fungicide in the 4 plants in this study indicate that at least one variable controlling the rate of action is the host plant itself.

81-0057. Pluta, J. (Dep. Appl. Pharm., Acad. Med., Wroclow, Poland) **Badania pozostalosci zwiazkow chlorowcopochodnych w granulatach zielarskich produkowanych w latach 1973-1975. [Determination of residues of chlorinated pesticides in herb granulates produced in 1973-1975.]** *Acta Polon. Pharm.* 37(3): 333-337; 1980 (7 references) (Polish).

Chlorinated pesticide residues present in a series of ground herb preparations were determined. Residues were measured of the compounds, *p,p'*-DDT, *o,p'*-DDT, DDE, DDD (TDE), DDA and HCH (BHC). Analysis was by gas chromatography. High levels of DDT and its metabolites were found in some samples, ranging up to 0.8 ppm. Residues of HCH and DMDT (methoxychlor) were low and did not in any case exceed 0.1 ppm. A decrease in DDT concentration over the years was noted.

81-0058. Pluta, J. (Dep. Appl. Pharm., Acad. Med., Wroclaw, Poland) **Zanieczyszczenie zwiazkami chlorowcopochodnymi ziol - skladnikow granulatow zielarskich. [Contamination of herbs - components of herbal granulates - with chlorinated pesticides.]** *Acta Polon. Pharm.* 37(3): 339-342; 1980 (11 references) (Polish).

The amounts of chlorinated pesticide residues [DDT, HCH (BHC) and DMDT (methoxychlor)] present as contaminants in ground herb preparations were estimated. The main contamination of the herbs was by DDT and its metabolites. Raw materials containing volatile oils of *Anthodium chamomillae, Folium melissae, Herba millefolli,* and *Rhizoma valerianae* contained the highest levels of these compounds.

81-0059. Feys, J. L. (Lab. Fytopathol. Plantenbescherming, Fac. Landbouwwet., Kathol. Univ. Leuven, B-3030 Heverlee, Belgium) **Residues of PCNB and MBC in witloof *(Cichorium intybus).*** *Agricultura (Heverlee)* 27(1): 23-45; 1979 (16 references).

Samples of witloof (chicory; *Cichorium intybus*) collected in Belgium were analyzed for residues of the fungicides pentachloronitrobenzene (PCNB; quintozene) and methyl-2-benzimidazole carbamate (MBC; carbendazim), and related compounds. Root, head and soil samples were collected in the growing fields and under controlled conditions. Samples were analyzed for PCNB, hexachloronitrobenzene (HCB), pentachloroaniline (PCA) and dichloran by gas chromatography with flame ionization detection (soil samples) or electron capture detection (root and crop samples). MCB content was analyzed with a UV spectrophotometer. High persistence was seen with PCNB, particularly when applied to the root tops. Dichloran residues also showed large variations due to the application methods. Residue levels were 0.528 ppm after application to root tops and 0.020 after soil incorporation. Soil and root MBC levels were low due to its complete breakdown. The residue values observed are compared with the residue tolerances of Belgium, Germany and The Netherlands.

81-0060. Matveev, Iu. M.; Spiridonov, Iu. Ya.; Shestakov, V. G. (All-Union Res. Inst. Phytopathol., Moscow, USSR) **Adsorbtsiya gerbitsidov osnovnymi komponetami pochvy. I. Adsorbtsiya piklorama guminovymi kislotami, polutornymi okislami i vtorichnymi mineralami. [Adsorption of herbicides by major soil components. I. Adsorption of picloram by humic acids, sesqui-oxides, and secondary minerals.]** *Agrokhimiya* (8): 130-134; 1980 (14 references) (Russian).

Adsorption of the herbicide picloram (4-amino-3,5,6-trichloropicolinic acid) by secondary minerals, humic acids, and sesqui-oxides isolated from different soil types was studied. Humic acids were found to be active adsorbents of picloram. Adsorptive capability of humic acids depended upon the soil type; adsorption capabilities of humic acids isolated from chernozem soil were found to be

4.6 fold greater than that of humic acids isolated from peat. Secondary minerals did not adsorb picloram. The level of adsorption of sesqui-oxides depended upon the ionization potential value of the metal.

81-0061. Spain, J. C.; Pritchard, P. H.; Bourquin, A. W. (Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **Effects of adaptation on biodegradation rates in sediment/water cores from estuarine and freshwater environment.** *Appl. Environ. Microbiol.* 40(4): 726-734; 1980 (12 references).

Experiments were devised to determine whether exposure to xenobiotics would cause microbial populations to degrade the compounds more rapidly during subsequent exposures. Studies were done with water/sediment systems (ecocores) taken from a salt marsh and a river. Systems were tested for adaptation to the model compounds methyl parathion and *p*-nitrophenol. $^{14}CO_2$ released from radioactive parent compounds was used as a measure of mineralization. River populations pre-exposed to *p*-nitrophenol at concentrations as low as 60 μg/l degraded the nitrophenol much faster than did control populations. River populations pre-exposed to methyl parathion also adapted to degrade the pesticide more rapidly, but higher concentrations were required. Salt marsh populations did not adapt to degrade methyl parathion. *p*-Nitrophenol-degrading bacteria were isolated from river samples but not from salt marsh samples. Numbers of nitrophenol-degrading bacteria increased 4 to 5 orders of magnitude during adaptation. Results indicate that the ability of populations to adapt depends on the presence of specific microorganisms. Biodegradation rates in laboratory systems can be affected by concentrations and prior exposure; therefore, adaptation must be considered when such systems are used to predict the fate of xenobiotics in the environment. (Author abstract by permission)

81-0062. Macek, K.; Birge, W.; Mayer, F. L.; Buikema, A. L., Jr.; Maki, A. W. (Bionomics Inc., EG & G, Wareham, MA 02571) **Discussion session synopsis.** *ASTM STP 657:* pp. 27-32; 1980.

Various types of aquatic toxicity tests which provide data for estimating or predicting toxicity of chemicals in the aquatic system are evaluated. A numerical evaluation of the relative utility of several types of tests was made based on weighted evaluation criteria (ecological significance, legal defensibility, availability of acceptable methods, utility of test results for predicting environmental effects, applicability, simplicity and cost). The types of tests for simple systems included acute lethality, embryo/larval, reproduction, residue accumulation, algal assay, orgonoleptic, structure/activity, behavioral, histological, physical and biochemical and *in vitro* tests. Complex system tests included field, diversity, benthic and microcosm tests. Those tests showing the highest ratings in terms of their present usefulness for assessing hazards to aquatic environments associated with specific chemicals were the acute lethality tests, embryo/larval toxicity tests, and tests on reproductive factors. Specific tests which could be effectively used along with the results of the above tests for gathering data on organophosphates and carbamates are acetylcholinesterase inhibition tests.

81-0063. Baughman, G. L.; Lassiter, R. R. (Environ. Res. Lab., US EPA, Athens, GA 30605) **Prediction of environmental pollutant concentration.** *ASTM STP 657:* pp. 34-54; 1980 (39 references).

In order to derive an organized hazard assessment program, there must be an accurate estimate of the concentration of various pesticides in the environment. Associated risks to several species can then be calculated using this concentration coupled with various laboratory toxicity tests. When using such procedures it is imperative that the effects of the environment on the chemical be considered. Chemicals in the environment can be transformed through ionization, hydrolysis, photolysis, microbial degradation, volatilization and partitioning. Generally first-order equations can estimate the reaction rates. Only by specifying realistic ranges of these environmental processes and their effects on the chemicals can a real understanding of environmental risk/benefits be made. Several pesticide formulations have been used to establish models of environmental degradation including pentachlorophenol (PCP), DDT, methyl parathion, methoxychlor, paraquat and toxaphene.

81-0064. Branson, D. R. (Environ. Sci. Res. Lab., Dow Chem. Co., Midland, MI 48640) **Predicting the fate of chemicals in the aquatic environment from laboratory data.** *ASTM STP 657:* pp. 55-70; 1980 (21 references).

Laboratory data can be used to produce reasonable predictions of chemical fate in the aquatic environment. Data such as evaporation, degradation, bioconcentration and particulate adsorption must be considered. Use of both the environmental rates approach and the model ecosystem approach to predict fate of chemicals is described. Use of the environmental rates approach allows predictions of the environmental concentrations at several different points in time. Use of the model ecosystem allows the identification of stable breakdown products as part of the test method. The uptake of HCB (hexachlorobenzene), DEHP (dioctyl phthalate) and chlorpyrifos by fish and the rates of evaporation of HCB, DDT, chlorpyrifos and DEHP are considered. Specific data is also provided on the biodegradation by model ecosystems, BOD measurements, biomagnification and partition coefficient correlations for pentachlorophenol (PCP). Bioconcentration and ecological magnification factors are presented for the more accumulative compounds (HCB, DDT and DEHP).

81-0065. Johnson, H. E.; Parrish, R.; Lee, G. F.; Johnson, C. E.; Sanborn, J.; Hansen, D.; Hamelink, J. (Dep. Fish & Wildl., Michigan State Univ., East Lansing, MI 48823) **Discussion session synopsis.** *ASTM STP 657:* pp. 71-77; 1980.

The prediction of the fate and concentration of chemicals in the aquatic environment is essential if hazard evaluation is to be realistic. Measurements of environmental and chemical properties as they are affected by various natural events are essential to effective hazard evaluation methods. It is suggested that mathematical modeling, the environmental rates approach, will be receiving greater attention in the future for hazard evaluation of pesticides than the physical, microsome, approach. The former method has the advantages of flexibility and lower cost and time requirements. The microcosm or physical models do, however, provide data on the rates of various processes that are a part of the mathematical models, thus serving to validate the reliability of the mathematical models. The laboratory ecosystem model also allows assessment of effects of the test chemical on the enclosed biotic community. The potential for bioaccumulation can be accurately assessed using either mathematical or physical models.

81-0066. Stern, A. M.; Walker, C. R. (Chem. Test. Branch, Off. Toxic Subst., US EPA, Washington, DC 20460) **Hazard assessment of toxic substances: environmental fate testing of organic chemicals and ecological effects testing.** *ASTM STP 657:* pp. 81-131; 1978 (215 references).

Before the potential hazard of commercially used chemicals can be evaluated, their ultimate environmental fate must be known. The transport and disposition of a chemical after its release from a point source must be considered. Such understanding helps to identify the area over which pollutants would be distributed, the types of reactions they would undergo, the chemical forms and concentrations in which they would be deposited, sensitive biological targets, and sequential information relative to the area of impact, concentration, period of exposure, and specificity of biological activity. Various methods for testing these issues have been proposed. Few attempts have, however, been made to design test protocols or to rank tests for individual chemicals. Documents available on environmental fate testing suggest that the design of the procedure is often made on an ad hoc basis and is too variable. Environmental fate testing does not provide any degree of standardization, and is extremely expensive. Systematic guidelines are presented for testing chemical-environmental fate and to provide a basis for constructing logical test protocols which are both cost effective and productive in that they expedite reasonable adjudications concerning the safety of commercially useful chemicals.

81-0067. Kimerle, R. A.; Gledhill, W. E.; Levinskas, G. J. (Environ. Assess. & Toxicol. Dep., Monsanto Co., St. Louis, MO 63166) **Environmental safety assessment of new materials.** *ASTM STP 657:* pp. 132-146; 1978 (3 references).

A new procedure to evaluate the hazards of new materials (including pesticides) to aquatic life is discussed. Important aspects of this proposal include the recognition of the need for environmental safety planning early in the development process for new chemicals. An environmental/human safety assessment schedule is used to outline all the necessary mammalian toxicity, aquatic toxicity and environmental fate studies which must be performed to evaluate the product. Data on product use, volume, disposal, chemical and physical properties, microbial degradation and acute toxicity are then presented and evaluated. A sequential 4-phase testing schedule has been established; screening, predicting, confirming and monitoring. Evaluation of the hazard is conducted by comparison of the margin that exists between exposure concentration and specific toxicological effect/no effect concentrations.

81-0068. Dickson, K. L.; Maki, A. W.; Peterson, J.; Wands, R. C.; Scheier, A. (Cent. Environ. Stud., Virginia Polytech. Inst. & State Univ., Blacksburg, VA 24061) **Discussion session synopsis.** *ASTM STP 657:* pp. 164-187; 1980.

Techniques for determining environmental concentrations and fates of various test materials were discussed. The application of the ASTM Hazard Assessment Procedure to a hypothetical test material (a pesticide) demonstrated that this material was very toxic to aquatic organisms and mammals but was readily degradable in soil. Under these conditions a safety assessment schedule would have been prepared emphasizing the reduction in toxicity resulting from biodegradation of the chemical in the soil. Soil leachable studies would have been needed to arrive at a reasonable estimate of the concentrations of the chemical in water. Results of the environmental fate studies would then be used to evaluate the hazards to aquatic organisms.

81-0069. Kenage, E. E.; Goring, C. A. I. (Health & Environ. Sci., Dow Chem. Co., Midland, MI 48640) **Relationship between water solubility, soil sorption, octanol-water partitioning, and concentration of chemicals in biota.** *ASTM STP 707:* pp. 78-115; 1980 (215 references).

A model is described which incorporates the average values of bioconcentration factors in fish, soil sorption coefficients, water solubility and *n*-octanol-water partition coefficients for 170 compounds (including organochlorine, organophosphate, carbamate, dinitroaniline, urea and triazine pesticides). Binary regression equations between the logarithms of these values gave significant correlation coefficients (below the 1% level). The measured value of any one of these parameters could

be used in the formulae to calculate the other 3 parameters. There are, however, 1 to 3 orders of magnitude confidence intervals associated with the estimates because of differences in techniques, soil and fish. The data are useful for assessment of bioconcentration and mobility of compounds in the environment.

81-0070. Bostater, C. R., Jr.; Pepino, R. V.; Roland, J. V. (Chesapeake Bay Unit, Maryland Water Resour. Admin., Annapolis, MD 21401) **Monitoring, analysis, and control of toxic and hazardous materials in the Chesapeake Bay.** *ASTM STP 707:* pp. 142-154; 1980 (41 references).

A report on a toxic and hazardous materials monitoring program in the Chesapeake Bay is given. The program is an effort by the US EPA, states of Maryland and Virginia, and the Chesapeake Bay community to develop a management program for toxic wastes, to demonstrate that the program is usable in other estuaries, and to disseminate gathered information to citizens, regulators and industries in the Bay area. Pollutants such as lindane, dieldrin, DDT, Kepone (chlordecone), butylated hydrocarbons and chlordane have been shown to exist in the Bay biota. The first step of the program involves determining the concentrations of these and other chemicals in each compartment of the ecosystem. Future studies will be directed toward analysis of processes and the flux of specific substances between compartments.

81-0071. Utracki, T. (Dep. Anal. Toxicol. Hyg. Pestic., Inst. Ind. Organ., PL-43200 Pszczyna, Poland) **Pozostalosci Kartoxu 50 w letach i bulwach ziemniaka. [Kartox 50 residues in potato stalks and bulbs.]** *Bromatol. Chem. Toksykol.* 13(1): 27-29; 1980 (5 references) (Polish).

Kartox 50 (10% lindane and 40% cartap), was applied on potato stalks; studies were then carried out to determine the residues of lindane and cartap in the potato tubers as well as its rate of decline in potato stalks. Experimental potato fields were sprayed with 1.0 and 1.5 kg/ha of a water suspension of Kartox 50 at 0.2 and 0.3% concentration. The rate of decline of the herbicides was tested every few days, and 7 days after herbicide application both lindane and cartap residues fell below detectable levels. Potato tubers were analyzed 30 and 90 days after herbicide treatment, and no residues above 0.01 mg/kg of lindane and 0.05 mg/kg of cartap were found. It is concluded that Kartox 50 does not contaminate potato tubers.

81-0072. Mahelova, E.; Uhnak, J.; Jelinkova, N. (Natl. Inst. Prev. Med., Bratislava, Czechoslovakia) **Rezidua chlorfenvinfosu v potravinovom retazci a ich hodnotenie [Residues of chlorfenvinphos in the food chain and their evaluation.]** *Cesk. Hyg.* 25(6-7): 361-366; 1980 (16 references) (Slovak).

The potentially harmful effects of chlorfenvinphos, an organophosphorus insecticide which has partly replaced chlorinated insecticides in crop protection, in the food chain were evaluated. The insecticide persists undecomposed in soil for up to 4 mo, and penetrates into crop plants, where it is bound to sugars. Residues have been found in milk, where they accumulate in the milk fat. Food processing was found to reduce residues in foods by up to 70%, depending on the process. Acute toxicities of rats, mice and guinea pigs are within an order of magnitude of 10 mg/kg, depending on the species. Dogs will tolerate up to 12,000 mg/kg administered orally. The maximum permissible dose (WHO) is 0.002 mg chlorfenvinphos/kg body wt. Eight metabolites have been identified, but they account for only a small proportion of the original substance. The principal metabolite, 2,4-dichloroacetophenone, accounted for 5% of the original weight of the insecticide.

81-0073. Paasivirta, J.; Sarkka, J.; Leskijarvi, T.; Roos, A. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Transportation and enrichment of chlorinated phenolic compounds in different aquatic food chains.** *Chemosphere* 9(7-8): 441-456; 1980 (23 references).

Studies are presented on chlorinated phenolic compounds in the aquatic food chain in Finland. Samples of plankton, zoobenthos, fish, and bottom sediments were taken in 3 lakes (two containing pulp and paper mill wastes and one thought to be in a nearly natural condition). Samples were analyzed by gas chromatography. Six phenolic compounds were isolated. Tetrachloroguaiacol was clearly enriched in the food chain; 192 ppb were found in pike and 20 ppb were found in roach. Pentachlorophenol (PCP; a wood preservative) was fairly evenly distributed among the sample areas, but did not show high enrichment in the food chain. Levels of PCP in plankton ranged from 0 to 14.4 ppb. It is suggested that the statistical analysis of these data can be of use in selecting optimal sample numbers in future studies.

81-0074. Hartwig, N. L.; Hall, J. K. (Pennsylvania State Univ., State College, PA) **Influencing the action of herbicides – runoff losses.** *Crops Soils* 33(1): 14-16; 1980.

A report is presented in which the conditions for loss of herbicides to groundwater are described. The slope of the field and soil factors such as texture, porosity, pH, organic matter, and moisture content are important. The intensity, duration, and total amount of rainfall, as well as the proximity of rainfall to the application area are climatic factors that effect runoff losses. Certain characteristics of the herbicides and the method of application are also important. Wettable powder, flowable, and dry flowable formulations are the most susceptible to runoff loss. Herbicides with very low water solubility (< 1 ppm) such as dinitroanilines, and ionic herbicides such as paraquat, are

strongly bonded to clay particles. If soil erosion can be reduced, then runoff of these herbicides can be reduced. Other methods of reducing runoff discussed include the use of herbicides that leach into the top soil, mechanically mixing herbicides into soil, reduction of soil erosion, and grass strips for filtering action and sediment-loss reductions.

81-0075. Connolly, J. P. (Univ. Texas, Austin, TX) **The effect of sediment suspension on adsorption and fate of Kepone.** *Diss. Abstr. Int. B* 41(4): 1229; 1980.

Using Kepone (chlordecone) as the test compound, the relation of sediment suspension to fate of hydrophobic toxic substances through adsorption was examined. Kinetic and equilibrium adsorptive behavior were experimentally characterized and quantified using mathematical models. Adsorption kinetics consisted of a rapid rate for ~ 5 min followed by a slow rate of approach to equilibrium. Time to equilibrium was 1 to 2 hr. Equilibrium was found to be a linear function of dissolved substance concentration and a nonlinear function of adsorbing solids concentration. A sediment bed was designed, constructed, and utilized to study Kepone movement between the sorbed and dissolved state and between bed and suspended sediment. A mathematical model of adsorption and sediment suspension was developed and utilized for illustration of important processes and estimation of the sensitivity of Kepone fate to adsorption kinetics and sediment suspension. Sediment suspension was found to be significant in compound fate, resulting in increased mass transfer between sorbed and dissolved states because of introduction of new sorption sites (net adsorption) or additional compound (net desorption) by continuous exchange of sediment between the bed and water column. These findings imply a necessity to consider sediment suspension in predictive analysis of the fate of hydrophobic toxic substances in natural water systems. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8021417)

81-0076. Surovtseva, E. G.; Vasil'eva, G. K.; Vol'nova, A. I.; Baskunov, B. P. (Inst. Microbiol., Moscow, USSR) **Razrushenie monokhloranilinov po meta-puti *Alcaligenes faecalis*. [Meta-pathway of monochloranilines degradation by *Alcaligenes faecalis*.]** *Dokl. Akad. Nauk SSSR* 254(1): 226-230; 1980 (8 references) (Russian).

Degradation of phenylamide pesticides by soil microorganisms was studied. Cultivation of the soil microorganism *Alcaligenes faecalis* with monochloroanilines, with subsequent chromatographic identification of the products of reaction, showed the presence of a methylated metabolite which was identical to the product of methylation of 5-chloro-2-oxymuconic acid.

81-0077. Spynu, E. I. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Kolichestvennye aspekty izucheniia povedeniya pestitsidov v okruzhaiushchei srede. [Quantitative aspects of behavior of pesticides in the environment.]** *Gig. Sanit.* 45(8): 68-69; 1980 (10 references) (Russian).

Various approaches to the quantitative analysis of pesticide behavior in the environment are reviewed. It is recommended that the general pesticide-environment system should be divided into a number of subsystems, such as pesticide-air (kinetics in the air and distribution of pesticide in environmental objects during pesticide application); pesticide-soil, pesticide-plants and pesticide-water (dynamics of pesticide in each medium); and pesticide-ecological systems (soil-air-food chains). The model should take into account direct and indirect factors that affect the process of pesticide degradation, and should be based on the data on physico-chemical properties of pesticide, chemical and structural characteristics of the environment, climatic parameters, and methods of application.

81-0078. Hankawa, Y. (Dep. Environ., Hiroshima Prefect. Agric. Exp. Stn, Higashihiroshima, Hiroshima, Japan) **[Studies on residues of organochlorine insecticides in crops and soils. Report 1. Residues of aldrin and dieldrin in potatoes in various growing seasons and in various organs, particularly on those cultivated in spring.]** *Hiroshima-Kenritsu Nogyoshikenjo Kenkyu Gyosekishu (Rep. Hiroshima Prefect. Agric. Exp. Stn.)* 3: 60; 1980 (Japanese).

Residues of aldrin and dieldrin in aerial parts of potato plants did not show large differences from germination to harvest, and averaged 0.0075 and 0.078 ppm, respectively. Residues in the roots were 1.512 aldrin and 1.723 ppm dieldrin in budding season, showed a sudden reduction in flowering season, and then a relatively stable level until harvest. Residues in tubers also showed a reduction after flowering season to the relatively stable level of 0.002 ppm aldrin and 0.1 ppm of dieldrin.

81-0079. Hankawa, Y. (Dep. Plant Pests, Hiroshima Prefect. Agric. Exp. Stn., Higashihiroshima, Hiroshima, Japan) **[Studies on residues of organochlorine insecticides in crops and soils. Report 2. Absorption of aldrin, dieldrin and endrin into cucumber fruits during the harvesting season.]** *Hiroshima-Kenritsu Nogyoshikenjo Kenkyu Gyosekishu (Rep. Hiroshima Prefect. Agric. Exp. Stn.)* 3: 60; 1980 (Japanese).

The levels of aldrin, dieldrin and endrin in cucumber fruits were greater in the early harvest stage than in the peak harvest stage. This was attributed to dilution of the insecticide taken up into the plant due to the increase in plant volume, and to the increased number of fruits. An exponential relationship was observed between residues of aldrin, dieldrin and endrin and the amounts absorbed into the cucumber fruits.

81-0080. Hankawa, Y. (Dep. Plant Pests, Hiroshima Prefect. Agric. Exp. Stn., Higashihiroshima, Hiroshima, Japan) **[Studies on residues of organochlorine insecticides in crops and soils. Report 3. Effects of the humus content of soil on the persistence of aldrin, dieldrin and endrin.]** *Hiroshima-Kenritsu Nogyoshikenjo Kenkyu Gyosekishu (Rep. Hiroshima Prefect. Agric. Exp. Stn.)* 3: 60; 1980 (Japanese).

To determine the effects of humus content on the persistence of aldrin and dieldrin in soil, these insecticides were applied to two soil types, and the levels present were investigated at various time intervals. The soil types studied were a grey lowland soil of low humus content and a high humus content kuroboku soil (volcanic ash based, black in color). Aldrin disappeared more rapidly in the grey soil than in the kuroboku soil. Conversion of aldrin to dieldrin took place for 3-5 mo after application in both soils. Despite this, the total dieldrin content of the soils declined continuously. The disappearance of dieldrin was generally slower than that of aldrin, and dieldrin disappeared more slowly from the kuroboku soil than from the grey soil.

81-0081. Roggi, C.; Zecca, E.; Galiotti, C.; Meloni, C. (Ist. Ig., Univ. Stud., Pavia, Italy) **Ricerca epidemiologica sull'uso dei pesticidi nella laborazione agricola. Nota 1: Valutazione dei residui di ditiocarbammato nell'uva e nel vino. [Epidemiological research on the use of pesticides in agriculture. 1. Determination of dithiocarbamate residues in grapes and wine.]** *Ig. Mod.* 74(1): 69-73; 1980 (7 references) (Italian).

The amounts of zineb residues present in grapes, wine and leaves was investigated on farms in Oltrepo Pavese. The method of Keppel was used to determine residue levels. All samples showed zineb residues < 2 ppm. The type of treatment used to make the wine did not alter the zineb concentration in the finished product. No significant differences was found in wines coming from 3 different stores of that area.

81-0082. Sinha, A. P.; Agnihotri, V. P.; Singh, K. (Indian Inst. Sugarcane Res., Lucknow, India) **Effects of Bavistin on soil microflora, their related physiological activity and growth of sugarbeet seedlings.** *Indian J. Exp. Biol.* 18(5): 489-491; 1980 (22 references).

Sandy loam soil samples were treated with Bavistin (carbendazim) at rates of 5, 10, 20 or 40 ppm (10, 20, 40 or 80 kg/ha). Bavistin treatment decreased the fungal population in the soil samples for periods of at least 45 days. The species most seriously affected were *Rhizoctonia, Penicillium, Aspergillus* and *Trichlderma.* Less affected were *Helminthosporium, Curvularia* and *Alternaria* species. The low concentrations of Bavistin, 5 to 20 ppm, slightly stimulated bacterial counts. Applications of at least 40 ppm reduced bacterial counts. At 5-40 ppm the nitrification process was reduced for 45 days. The germination of sugarbeet seed was not impaired by Bavistin. However, the length of root and height of plant were decreased as the concentration of Bavistin increased. It is suggested that this may have been due to accumulation of ammonia to toxic levels in the soil.

81-0083. Klysheva, A. L.; Golovleva, L. A.; Ilialetdinov, A. N. (Inst. Microbiol. & Virol., Alma-Ata, USSR) **Prevrashchenie ordama mikroorganizmami, vydelennymi iz pochv risovykh polei Kazakhstana. [Transformation of ordam by microorganisms isolated from the soil of rice fields of Kazakhstan.]** *Izv. Akad. Nauk Kaz. SSS Ser. Biol.* (4): 24-34; 1980 (4 references) (Russian).

The effect of soil microflora isolated from the Kazakhstan rice fields on biodegradation of the herbicide Ordram (molinate; S-ethylhexahydro-1-N-azepine-1-carbothioate) was studied. Various *Bacillus* species were found capable to metabolize Ordram in the presence of saccharose. Complete degradation of Ordram by *Bacillus* sp. was achieved in 5-7 days. The rate of Ordram degradation depended upon aeration, temperature, and concentration of salts in the medium.

81-0084. Miller, G. C.; Zisook, R.; Zepp, R. (Div. Biochem., Univ. Nevada, Reno, NV 89557) **Photolysis of 3,4-dichloroaniline in natural waters.** *J. Agric. Food Chem.* 28(2): 1053-1056; 1980 (15 references).

Sunlight irradiation of 3,4-dichloroaniline (DCA) in natural water samples resulted in both direct and sensitized photoreactions. A procedure is described for separating the effects of competitive light absorption of the water from sensitized processes. Although the overall photolysis rates of DCA were slower in the natural waters than in distilled water (depth 6.2 cm), the rates in natural waters were faster than expected, on the basis of sunlight received by the DCA. Kinetic results were qualitatively the same when a commercial humic acid solution with similar light absorption characteristics was used. TCAB (3,4,3′,4′-tetrachloroazobenzene) was produced in 2 ricefield waters containing 6.1×10^{-6} to 2.9×10^{-4} *M* DCA. The concentration of TCAB produced was greater in the more concentrated DCA solutions, although the yields were in no case greater than 1% of the reacted DCA. The chemical yield of TCAB was considerably lower in the commercial humic acid solutions than in the natural water samples. TCAB was not observed in distilled water. (Author abstract reprinted by permission of the American Chemical Society)

81-0085. Lamoureux, G. L.; Rusness, D. G. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Pentachloronitrobenzene metabolism in peanut. 1. Mass spectral characterization of seven glutathione-related**

conjugates produced *in vivo* or *in vitro*. *J. Agric. Food Chem.* 28(2): 1057-1070; 1980 (40 references).

[^{14}C]Pentachloronitrobenzene (PCNB; quintozene) was rapidly absorbed through the roots of hydroponically grown peanuts (*Arachis hypogae* L. cv. Spanish); however, only 4-7% of the absorbed radioactivity was translocated to the shoots. Thirty-seven days following treatment, 6% of the radioactivity in the roots was soluble in chloroform, 24% was soluble in ether ether, 33% was soluble in water, and 37% was insoluble in 80% methanol. The following polar metabolites were isolated from root tissue and characterized by synthesis and/or mass spectrometry: *S*-(pentachlorophenyl) glutathione, *S*-(*ar*-tetrachloronitrophenyl)glutathione, *S,S'*-(*ar*-tetrachlorophenylene)dicysteine, *S*-(pentachlorophenyl-*N*-malonylcysteine, and *S*-(*ar*-tetrachloronitrophenyl)-*N*-malonylcysteine. In addition, the presence of two isomer forms of *S,S'*-(*ar*-tetrachlorophenylene) diglutathione was indicated by *in vitro* and *in vivo* experiments. *S*-(Pentachlorophenyl) cysteine and pentachloroaniline were among the precursors of the insoluble residue. Glutathion-*S*-transferase enzymes that utilized PCNB as a substrate were isolated from pea (*Pisum sativum* L. cv. Little Marvel) and peanut. Products from the reaction catalyzed by the pea enzyme were identical with products isolated from peanut roots. (Author abstract reprinted by permission of the American Chemical Society)

81-0086. Rusness, D. G.; Lamoureux, G. L.* (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Pentachloronitrobenzene metabolism in peanut. 2. Characterization of chloroform-soluble metabolites produced *in vivo*.** *J. Agric. Food Chem.* 28(2): 1070-1077; 1980 (23 references).

Chloroform-soluble metabolites of pentachloronitrobenzene-UL-^{14}C (PCNB; quintozene) were isolated, identified, and quantitated from roots of peanut plants (*Arachis hypogae* L. cv. Spanish) grown under hydroponic conditions. After 4 days, 59.2% of the radioactivity was chloroform soluble, and the distribution of these metabolites in the peanut root was the following: pentachlorothioanisole, 3.1%; pentachloroaniline, 22.5%; pentachlorothiophenol, 2.6%; pentachlorophenyl methyl sulfoxide, 0.50%; *S*-(pentachlorophenyl)-2-thioacetic acid, 0.48%; *S*-(pentachlorophenyl- 3-thiopropenoic acid, 0.15%; *S*-(pentachlorophenyl) cysteine, 0.04%; unidentified, 1.1%; and parent fungicide (PCNB), 28.7%. All products except *S*-(pentachlorophenyl) cysteine were identified by mass spectral analysis. An aryl nitro reductase enzyme activity that catalyzed the reduction of PCNB to pentachloroaniline was isolated from peanut root. Key chloroform-soluble ^{14}C metabolites of PCNB (pentachloroaniline, pentachlorothiophenol, *S*-(pentachlorophenyl-2-thioacetic acid, and *S*-(pentachlorophenyl) cysteine) were reintroduced into peanut plants to determine if further metabolism occurred. The proposed pathway for the formation of the chloroform-soluble PCNB metabolites and their significance are discussed. (Author abstract reprinted by permission of the American Chemical Society)

81-0087. Winterlin, W.; Walker, G.; Hall, G.; McFarland, J.; Mourer, C. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Environmental fate of dialifor and formation of its oxygen analog following application on grape vines in the San Joaquin Valley, California.** *J. Agric. Food Chem.* 28(2): 1078-1083; 1980 (17 references).

Dialifor (Torak) insecticide formulation was applied at the highest permissible dosage to California grapes in the San Joaquin Valley. Dislodgeable foliar residues are reported for determining potential exposures of agricultural workers who may come into contact with the treated foliage under California conditions using normal recommended practices. Experimental plots, which had been dusted just before and after application, and nutrient additives to the formulation were evaluated for their effect on the pesticide persistance and oxygen analog formation. Although the dissipation of dialifor was slower than that of many organophosphorus compounds, the dust and nutrient treatments had little if any influence on dissipation or oxygen analogue formation. The results from this study also question the cause of a reported California worker injury episode and lends credence to the possibility of a misapplication as the primary cause of injury. Fruit sampled 120 days post-application contained residues under the established tolerance of 1.0 ppm. (Author abstract reprinted by permission of the American Chemical Society)

81-0088. Yu, C. C.; Atallah, Y. H.*; Witacre, D. M. (Res. & Dev. Dep., Velsicol Chem. Corp., Chicago, IL 60611) **Metabolism of the herbicide buthidazole in corn seedlings and alfalfa plants.** *J. Agric. Food Chem.* 28(2): 1090-1095; 1980 (6 references).

[^{14}C]Buthidazole {3-[5-(1,1-dimethylethyl) -1,3,4-thiadazol-2-^{14}C-yl]-4-hydroxy-1-methyl-2-imidazolidinone} was absorbed from nutrient solution and translocated by corn seedlings. Most of the radiocarbon in seedlings could be extracted by ethanol. Unextracted radiocarbon gradually increased to 19% at day 25; however, acid hydrolysis released almost all of the conjugated metabolites in solids. Buthidazole was slowly but steadily metabolized. Unchanged buthidazole constituted 96% of the total radiocarbon at day 1, decreasing to 62% at day 25. The major degradation pathways were conjugation, hydroxylation, and N-demethylation. Alfalfa plants translocated and metabolized buthidazole more quickly and extensively than did corn seedlings. Unchanged buthidazole constituted 15% of total radiocarbon in alfalfa plants after 2 days but only 4% after 16 days. The major

degradation pathway in alfalfa was hydroxylation of the imidazolidinone ring, followed by ring opening and subsequent *N*-demethylation and hydrolysis. (Author abstract reprinted by permission of the American Chemical Society)

81-0089. Khan, S. U. (Chem. Biol. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario K1A OC6, Canada) **Plant uptake of unextracted (bound) residues from an organic soil treated with prometryn.** *J. Agric. Food Chem.* 28(2): 1096-1098; 1980 (7 references).

Soil-bound ^{14}C residues were absorbed by the oat plants grown in an organic soil treated with ^{14}C-ring-labeled prometryn [2-(methylthio) -4,6-bis(isopropylamino)-*s*-triazine]. The roots contained more extractable ^{14}C residues (75.0%) than did shoots (51.1%). The majority of extractable ^{14}C residues in the plant tissue was present in the form of conjugates. Plant-bound ^{14}C unextractable residues were lower (19.9%), but greater in shoots (40.2%). Mono- and di-N-dealkylated metabolites of prometryn were present in the plant bound ^{14}C residues. A major portion of bound ^{14}C residues in plant tissues was associated with lignin. (Author abstract reprinted by permission of the American Chemical Society)

81-0090. Rao, D. M. R.; Murty, A. S.* (London Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Persistence of endosulfan in soils.** *J. Agric. Food Chem.* 28(2): 1099-1101; 1980 (21 references).

The persistence (at > 0.05 ppm) of total endosulfan residues under natural conditions of wet and dry cultivation was studied. When the initial dose of application was the same, the residues persisted for about 120 days in wet soils and 100 days in dry soils. There was a difference in the persistence of the pesticide in three dry soils that received low, normal, and high initial doses, and the residue persisted for 60, 100 and 160 days, respectively. Except in the dry soil that received the high dose, in all other soils endosulfan sulfate was the principal metabolite. In the former, endosulfan alcohol and endosulfan ether were the principal metabolites for the first 50 days, after which endosulfan sulfate appeared. (Author abstract reprinted by permission of the American Chemical Society)

81-0091. Ziegler, W.; Engelhardt, G.; Wallnoefer, P. R.*; Oehlmann, L.; Wagner, K. (Abt. Pflanzenschutz, Bayerische Landesanst. Bodenkult. & Pflanzenbau, D-8000 Munich 19, BRD) **Degradation of demeton *S*-methyl sulfoxide (Metasystox R) by soil microorganisms.** *J. Agric. Food Chem.* 28(2): 1102-1106; 1980 (8 references).

The insecticide demeton *S*-methyl sulfoxide (I; oxydemeton-methyl) is degraded by *Pseudomonas putida* 1453 by cleavage of the thioester bond to form three major compounds: 2-(ethylsulfinyl) ethanethiol (II), 2-(ethylsulfonyl) ethanethiol (III), and bis[2-ethylsulfinyl) ethyl]disulfide (IV), an oxidation production of II. *Nocardia* sp. DSM 43252 converts the insecticide into another three metabolites: bis[2-(ethylsulfonyl) ethyl]disulfide (V), bis[2-(ethylsulfinyl) ethyl]sulfide (VI), and bis[2-(ethylsulfonyl) ethyl]sulfide (VII), via oxidation, β elimination, and hydrolysis. *O,O*-Dimethylthiophosphoric acid had been detected in the aqueous layer of the medium. (Author abstract reprinted by permission of the American Chemical Society)

81-0092. Belasco, I. J. (Biochem. Dep., Res. Stn., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE 19898) **Position of the radiolabel in glycine resulting from 2-^{14}C-DPX-3217 (^{14}C-labeled Curzate fungicide) metabolism.** *J. Agric. Food Chem.* 28(2): 1106-1108; 1980 (5 references).

Studies using *Peptococcus glycinophilus*, a glycine-specific bacterium, demonstrated that radiolabeled glycine in plants treated with [2-^{14}C]DPX-3217 (^{14}C-labeled Curzate fungicide; 2-cyano-*N*-[(ethylamino) carbonyl]-2-(methoxyimino) acetamide) was exclusively labeled in the methylene group, corresponding to the position in the parent compound. These findings provide evidence that glycine is a primary metabolite of DPX-3218 rather than a product of metabolic re-incorporation of the radiolabeled carbon. (Author abstract reprinted by permission of the American Chemical Society)

81-0093. Clay, V. E.; Fahmy, M. A. H.; Martin, J. P.; Fukuto, T. R.* (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Degradation of 2,3-dihydro-2,2- dimethyl-7-benzofuranyl (di-*n*-butylaminosulfenyl)methylcarbamate in Cosad sandy loam.** *J. Agric. Food Chem.* 28(2): 1122-1129; 1980 (10 references).

DBSC [FMC-35001 or 2,3-dihydro-2,2-dimethyl-7-benzofuranyl (di-*n*-butylaminosulfenyl) methylcarbamate] was rapidly degraded in Cosad sandy loam with a half-life of about 2-3 days. Thiolysis of DBSC was first order. DBSC degraded to carbofuran, which was either oxidized at the 3 position of the ring or hydrolyzed at the carbamate ester to form carbofuran phenol. Bis(carbofuran)disulfide, dibutylamine, and at least 7 unidentified minor compounds were also detected. Phenolic degradation products appeared to be bound to the soil humus by an oxygen-dependent process. Also, ring cleavage was found to be an oxygen-dependent process. (Author abstract reprinted by permission of the American Chemical Society)

81-0094. Clay, V. E.; Martin, J. P.; Fukuto, T. R.* (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Degradation of 2,3-dihydro-2,2-**

dimethyl-7-benzofuranyl (morpholinosulfenyl) methylcarbamate in Cosad sandy loam. *J. Agric. Food Chem.* 28(2): 1129-1130; 1980 (3 references).

MSC [FMC-31768 or 2,3-dihydro-2,2-dimethyl-7-benzofuranyl (morpholinosulfenyl) methylcarbamate] was degraded rapidly in Cosad sandy loam with a half-life of about 2 days. Carbofuran and carbon dioxide were the only major degradation products identified. The thiolysis of MSC was first order. (Author abstract reprinted by permission of the American Chemical Society)

81-0095. Simoneaux, B. J.; Martin, G.; Cassidy, J. E.; Ryskiewich, D. P. (Agric. Div., Ciba-Geigy Corp., Greensboro, NC 27409) **Isolation and identification of the major polar metabolites of methidathion in tomatoes.** *J. Agric. Food Chem.* 28(2): 1221-1224; 1980 (8 references).

Tomatoes treated topically with [^{14}C]methidathion equivalent to 10 ppm in the whole fruit were found to produce two major polar metabolites. One was characterized by chromatographic techniques as de-monomethyl methidathion. The second metabolite was identified by mass spectrometry as a cysteine conjugate. Confirmation of the postulated structure for the cysteine conjugate was done by co-chromatography with a synthesized standard using several thin layer chromatographic and electrophoretic systems. A method for synthesis of this conjugate is reported. The presence of these metabolites in other crops is discussed. (Author abstract reprinted by permission of the American Chemical Society)

81-0096. Ruzo, L. O.; Lee, J. K.; Zabik, M. J. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkley, CA 94720) **Solution-phase photodecomposition of several substituted diphenyl ether herbicides.** *J. Agric. Food Chem.* 28(2): 1289-1292; 1980 (14 references).

The solution photoproducts of eight substituted diphenyl ethers irradiated at 300 nm were identified. Water, cyclohexane, and methanol were used as solvents. The major reaction pathways observed included reductive dehalogenation, decarboxymethylation, reduction of nitro substituents, and cleavage of the ether linkage to yield phenols. Nucleophilic substitution by the solvent was also observed. (Author abstract reprinted by permission of the American Chemical Society)

81-0097. Spencer, W. F.; Shoup, T. D.; Spear, R. C. (Univ. California, SEA, USDA, Riverside, CA 92521) **Conversion of parathion to paraoxon on soil dusts as related to atmospheric oxidants at three California locations.** *J. Agric. Food Chem.* 28(2): 1295-1300; 1980 (15 references).

Parathion-treated soil dusts were exposed outdoors near air-quality monitoring stations at three California locations. Results indicated that paraoxon production from parathion was controlled by atmospheric ozone concentration and type of soil dust. The ratio of paraoxon to parathion after 24 hr ranged from an average of 0.117 in Mocho dust at a coastal site to 0.943 in Hanford dust at an inland site. The correlation coefficient (r) between daily paraoxon production and daily peak ozone was 0.776, 0.701, and 0.773 for San Joaquin, Hanford, and Mocho dusts. Adding the additional variables of maximum temperature and minimum relative humidity only slightly improved correlations. In areas with relatively high ozone levels, the daily average, highest hourly average and peak ozone concentrations were equally good indicators of paraoxon formation rate. Neither total radiation nor UV was correlated with paraoxon production or with atmospheric ozone. Both parathion and paraoxon volatilized rapidly when no soil dust particles were present. (Author abstract reprinted by permission of the American Chemical Society)

81-0098. Newsome, W. H. (Food Res. Div., Health Prot. Branch, Food Dir., Dep. Natl. Health & Welfare, Ottawa, Ontario K1A OL2, Canada) **Residues of maleic hydrazide in field-treated potatoes.** *J. Agric. Food Chem.* 28(2): 1312-1313; 1980 (6 references).

Maleic hydrazide was determined in potato tubers at intervals after field treatment. Levels declined from 8.3 ppm at 3 wk to 5.3 ppm at 6 wk and remained constant thereafter. Storage of samples taken 7 wk post-treatment did not result in changes in concentration for up to 8 wk. Analysis of fresh or stored samples for the β-D-glucoside and free hydrazine resulted in no detectable residues of either compound. (Author abstract reprinted by permission of the American Chemical Society)

81-0099. Kawano, Y.; Yanagihara, K.; Miyamoto, T.; Yamamoto, I. (Dep. Agric. Biochem., Coll. Trop. & Hum. Resour., Univ. Hawaii, Honolulu, HI) **Examination of the conversion products of pyrethrins and allethrin formulations exposed to sunlight by gas chromatography and mass spectrometry.** *J. Chromatogr.* 198(3): 317-328; 1980 (17 references).

Natural and synthetic pyrethrins in kerosene solution similar to commercial formulations were stored in clear soft-glass bottles and exposed to sunlight through clear window glass. Transition photoproducts were observed by gas chromatography (GC) for cinerin I and II, and jasmolin I and II, which revealed slightly shorter retention times than the pyrethrins. No photoproducts for pyrethrin I and II were observed, which may have polymerized or been converted into products of higher polarity. Critical studies on the photoproduct from jasmolin I indicated the isomerization of (Z)-pent-2-enyl side-chain of the rethrolone moiety to the (E)-isomer. Other circumstantial

evidence indicated that a similar change occurred with jasmolin II and cinerin I and II. Allethrin, under similar conditions, had a photoproduct with a longer retention time, which was identified as an isomer with a cyclopropyl side-chain, the *d,l*-cyclopropylrethronyl *d-trans*-crysanthemate. (Author abstract by permission)

81-0100. McLeod, H. A.; Smith, D. C.; Bluman, N. (Food Res. Div., Bur. Chem. Saf., Food Dir., Health Prot. Branch, Ottawa, Ontario K1A OL2, Canada) **Pesticide residues in the total diet in Canada, V: 1976 to 1978.** *J. Food Saf.* 2(3): 141-164; 1980 (17 references).

A discussion of the pesticide residues in the total diet in Canada for the years 1976 to 1978 is presented. Foods representative of Canadian diets were prepared for eating, then blended and analyzed for pesticides, derivatives, and industrial contaminants. The results indicated that 24 residues including organochlorine, organophosphorus, sulfur, nitroaniline, phthalonitrile and carbamate compounds contaminate the diets. Regional and seasonal fluctuations are presented. It is concluded that the levels of pesticides are decreasing, and that the levels of all the residues are within the FAO/WHO acceptable intake.

81-0101. Kallio, H.; Linko, R. R.; Tikanmaki, E.; Puntari, I. (Dep. Chem. & Biochem., Lab. Food Chem., Univ. Turku, SF-20500 Turku 50, Finland) **Effect of nitrapyrin on residues and nitrate content in red beet roots fertilized with urea.** *J. Sci. Food Agric.* 31(7): 701-708; 1980 (37 references).

Studies were performed to determine the effect of the nitrite inhibitor nitrapyrin and its residues on the nitrate content of roots fertilized with urea. On June 8, 1977, experimental plots of beets were planted and fertilized with urea (230 kg/ha^1) which had been coated with nitrapyrin. At various intervals, soil and beet samples were taken and analyzed for nitrate and nitrapyrin content. On 15 August the nitrapyrin residues on roots was 0.00-1.14 μg/g, and on 1 October 0.00-0.45 μg/g. The nitrapyrin decreased NO_3^- content in both soil and beets. The reduction in the roots was 44% from the level of the controls.

81-0102. Kolesnikov, V. A.; Karetskaia, N. A.; Petukhova, V. I. (Res. Inst. Veg. Grow., USSR) **Effektivnost' gerbitsidov na posevakh chesnoka. [Efficacy of herbicides in garlic crop.]** *Khim. Sel'sk. Khoz.* 18(8): 38-40; 1980 (Russian).

Treflan (trifluralin; 2 kg/ha), Daktal (16 kg/ha), Ramrod (propachlor; 7.5-9.0 kg/ha), prometryne (2.5 kg/ha) and linuron (2.5 kg/ha) were applied to garlic crop. All herbicides but Daktal and Treflan showed complete degradation in the arable soil layer during the vegetative period. The residual amounts of Daktal and Treflan prior to harvest did not exceed 0.04 and 0.08 mg/kg, respectively.

81-0103. Zhukova, P. S.; Shirko, T. S.; Rogozhnikov, V. G.; Kamzolova, O. I.; Botina, T. I. (Byelorussian Res. Inst. Potato Veg. & Fruits Grow., USSR) **Vliianie gerbitsidov i mineral'nykh udobrenii na produktivnost' morkovi. [Effect of herbicides and mineral fertilizers on carrot productivity.]** *Khim. Sel'sk. Khoz.* 18(9): 43-46; 1980 (Russian).

The results of field trials of the effect of the herbicides prometryne and linuron (2 kg/ha) and mineral fertilizers on the yield and quality of carrot are reported. Prometryne showed rapid degradation in the soil; 1 mo after application a 0-10-cm layer contained 13.4-22.3% of the applied amount. Residual amounts of prometryne in the root crop ranged from 0.04 mg/kg (variant with nitrogenous fertilizers) to 0.15 mg/kg (variant with complete mineral fertilizers). Residual amounts of linuron in the root crop ranged from 16.1% of the applied amount (variant with nitrogenous fertilizer) to 14% (variant with complete mineral fertilizers), and 12.2% (variant without fertilizers).

81-0104. Sergeeva, D. (Author address not given) **Efekt ot kulinarnata i tekhnologichnata obrabotka na mlyakoto, sudurzhashto ostatutsi ot organofosforni i karbamatni pestitsidi. [Effect of the culinary and technological processing of milk containing organophosphorus and carbamate pesticides.]** *Khranit. Promst.* 28(2): 27-29; 1979 (6 references) (Bulgarian).

The effects of culinary and industrial processes on the neguvon (dichlorvos), phosalone and carbaryl residue levels in milk products were studied using milk containing neguvon at 0.632 mg/l, phosalone at 0.390 mg/l and carbaryl at 0.302 mg/l, obtained from cows experimentally treated with the pesticides. Pasteurization of the milk at 63° C for 30 min reduced the neguvon level by 92%, phosalone by 42% and carbaryl by 90%. Boiling the milk destroyed 93% of the neguvon, 74% of the phosalone, and 94% of the carbaryl. Processing the milk into sour milk reduced the residue levels by 78-97%. During the ripening of white brine cheese the residue levels decreased by 52-80%. Processing the milk to butter caused concentration of the residues in the cream and later in the butter: the highest residue levels found in the butter were 0.175 mg/kg for carbaryl, 0.293 mg/kg for phosalone, and 0.457 mg/kg for neguvon.

81-0105. Letourneau, L.; Cescas, M. P. (Coll. Enseignement Gen. & Prof., Levis-Lauzon, Quebec G1K 7P4, Canada) **Chimie des residues de l'arsenic applique a des vergers du Quebec. [Chemistry of residual arsenic applied**

to the orchards of Quebec.] *Nat. Can. (Quebec)* 105(4): 265-276; 1978 (36 references) (French).

Arsenic levels were determined in orchard soil in three regions of Quebec (Belle-Riviere, Oka and Dalhousie) after As had been applied as an insecticide for many years. It was calculated that the usual application rates, with 8-10 treatments/yr using lead arsenate plus calcium arsenate, about 1536 kg/ha of lead and 1040 kg/ha of arsenic had been applied over a 25-yr period. The highest As levels were found in the surface layer of the soil (75-120 ppm), with a rapid reduction of the levels with increasing depth. The As concentration leveled off at a depth of 22.5 cm in Oka and Dalhousie soils, and at 30 cm in the Belle-Riviere soil. The quantity of As bound to iron was 3 to 4 fold higher than that bound to aluminum.

81-0106. Crabbe, R.; Elias, L.; Krzymien, M.; Davie, S. (Natl. Aero. Estab., Ottawa, Ontario, Canada) **New Brunswick forestry spray operations: field study of the effect of atmospheric stability on long range pesticide drift.** *NRCC Natl. Aero. Estab.* LTR-UA-52: 66 pp.; 1980 (18 references).

Studies were performed to determine the effects of atmospheric stability on pesticide drift. Selected areas were sprayed with about 100 kg of a non-toxic inert chemical to simulate pesticide application. Concentrations were measured before, during and after release. Meteorological parameters were taken. Twenty-six air sampling stations were arranged as far as 45 km downwind of the spray site. Results showed that under stable meteorological conditions (morning, light winds) the material was transported the farthest. At 7.5 km downwind the treetop level ranged from 50 ng/l/min to about 300 ng/l/min as conditions progressed from least to most stable. The importance of these findings to spray techniques is discussed.

81-0107. Crabbe, R.; Krzymien, M.; Elias, L.; Davie, S. (Natl. Aero. Estab., Ottawa, Ontario, Canada) **New Brunswick spray operations: measurement of atmospheric fenitrothion concentrations near the spray area.** *NRCC Natl. Aero. Estab.* LTR-UA-56: 64 pp.; 1980.

Studies were performed to determine the extent of drift of the pesticide fenitrothion from spray areas. Atmospheric concentrations were measured at breathing height in a forest and at surface levels around a cleared area. The calculated inhalation exposure levels in the first hr after forest spraying were ~ 250 ng fenitrothion at the spray line and ~ 50 ng fenitrothion 700 m from the spray line. Surface dosages around the cleared area were about 30 ng/l/min at 300 m and 7 ng/l/min at 800 m downwind. Fenitrothion volatilization after a morning spray resulted in a sustained vapor plume through the afternoon: concentrations at 1.5 m above ground level were 25 ng/l at the spray line and 1 ng/l at 190 m. This plume was estimated to contribute up to 0.4 μg of respirable fentitrothion. A graphic method for predicting concentrations of the pesticide at various distances from the spray line was developed.

81-0108. Leahey, J. P.; Carpenter, P. K. (Plant Prot. Div., Jealott's Hill Res. Stn., ICI Ltd., Bracknell, Berkshire RG12 6EY, England) **The uptake of metabolites of permethrin by plants grown in soil treated with ^{14}C-permethrin.** *Pestic. Sci.* 11(2): 279-289; 1980 (11 references).

Sugar beet, wheat, lettuce and cotton were grown in soil treated with [^{14}C]permethrin, the crops being sown at intervals of 30, 60 and 120 days after treatment of the soil. The uptake of radioactive residues into these crops was measured. Low radioactive residues (up to 0.86 μg/g) were detected in the mature plants sown 30 days after soil treatment, and this uptake declined significantly as the interval between soil treatment and sowing increased. Metabolites derived from the acid moiety of the permethrin molecule were shown to constitute the greater part of the residue transferring from the soil to the crops. *(1RS)-cis-* and *(1RS)-trans-*3- (2,2-dichlorovinyl) -1-methylcyclopropane-1,2-dicarboxylic acid were identified as the major acidic metabolites. The latter compound is a metabolite of permethrin which has not previously been identified in soil or plants. (Author abstract by permission)

81-0109. Bromilow, R. H.; Baker, R. J.; Freeman, M. A. H.; Gorog, K. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **The degradation of aldicarb and oxamyl in soil.** *Pestic. Sci.* 11(4): 371-378; 1980 (22 references).

The breakdown of oxamyl was studied in 3 downland chalk soils, a peat loam, a sandy loam, and the same sandy loam modified by adding peat. The kinetics of aldicarb degradation via its sulfoxide and aldoxycarb (aldicarb sulfone) was also studied in these 2 sandy loam soils. All the reactions followed first-order kinetics, the reaction being faster in the original than in the modified sandy loam. Rates of reaction were slower at low moisture contents, and decreased markedly when the temperature was reduced from 10 to 5° C though less so than from 15 to 10° C. (Author abstract by permission)

81-0110. Leistra, M.; Bromilow, R. H.; Boesten, J. J. T. I. (Lab. Res. Insect., NL-6709 PG Wageningen, The Netherlands) **Measured and simulated behavior of oxamyl in fallow soils.** *Pestic. Sci.* 11(4): 379-388; 1980 (19 references).

The movement and breakdown of the insecticide and nematicide oxamyl was monitored in fallow sandy loam soils under field conditions. Using measurements of rainfall and evaporation from a water surface, the water

flow in soil was simulated by a computer model, and the results were compared with the measured soil-moisture profiles. The model was extended to simulate the behavior of oxamyl, using laboratory data for adsorption and rates of degradation in soil. The model generally underestimated oxamyl movement in the first month, whereas it tended to overestimate later movement. The rate of breakdown of oxamyl, as affected by soil type, temperature and soil-moisture content, was fairly well described. After about 2 mo only small amounts of oxamyl remained. Accumulation of oxamyl near the soil surface in dry periods was overestimated, indicating deficiencies in the modelling procedure under these conditions. (Author abstract by permission)

81-0111. Bromilow, R. H.; Leistra, M. (Chem. Liaison Unit, Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Measured and simulated behavior of aldicarb and its oxidation products in fallow soils.** *Pestic. Sci.* 11(4): 389-395; 1980 (9 references).

Aldicarb and its oxidation product aldoxycarb (alicarb sulfone) were applied separately to columns of fallow, sandy loam soils under field conditions. The breakdown and movement of these compounds were monitored, as was the behavior of aldicarb sulfoxide and aldoxycarb formed by oxidation of the applied aldicarb. The behavior of these compounds was simulated by a computer model using laboratory data for adsorption and rates of degradation in soil. The model simulated the observed behavior reasonably well, although redistribution of chemicals was often more rapid than predicted. Production of aldoxycarb from the sulfoxide was less in the field than was expected from the laboratory incubations. Accumulation of chemicals near the soil surface in dry periods was overestimated, indicating that the processes occurring under these conditions are not well described by the model. About 4 mo after application, only aldoxycarb, in small amounts, remained in the soils. (Author abstract by permission)

81-0112. Domir, S. C. (Nurs. Crops. Res. Lab., Agric. Res., SEA, USDA, Delaware, OH 43015) **Fate of ^{14}C-daminozide and ^{14}C-maleic hydrazide in American elm *(Ulmus americana* L.).** *Pestic. Sci.* 11(4): 418-422; 1980 (15 references).

Radiolabeled daminozide and maleic hydrazide (MH) were injected into American elm seedlings, kept in nutrient solution, to determine their translocation pattern and metabolic fate. Both compounds were rapidly translocated to all parts of the plant. After 21 days, 13% of the applied ^{14}C was exuded into the nutrient solution from the roots of the plants treated with MH. Using gel-filtration and thin layer chromatographic techniques, it was determined that daminozide did not form any metabolite, and the MH was converted into a MH-sugar complex. A significant amount of ^{14}C was unextractable from the plant tissue. (Author abstract by permission)

81-0113. Dikshit, A. K.; Handa, S. K.; Awasti, M. D.; Verma, S. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi 110012, India) **Dissipation of metaxystox *(sic)* in or on mustard crop.** *Pesticides* 14(3): 15-23; 1980 (6 references).

Studies were performed to determine the nature of the dissipation of the insecticide metasystox (oxydemeton-methyl) when sprayed onto mustard. Mustard grown in 4 m × 4 m plots was sprayed with 0.03 and 0.05% sprays from 25% EC formulations at 4 l/plot. A similar application was repeated after 15 days. Plants were drawn randomly at 0, 3, 5, 7, 10 and 15 days after first application, and pod samples were collected at 0, 1, 3, 5, 7, 10, 15, 20 and 30 days after the second treatment. Fifty g of each were analyzed colorimetrically to determine insecticide levels. Experiments were also conducted to determine if washing and cooking before analysis reduced levels of the pesticide. Initial residues of the 0.03 and 0.05% sprays were 4.0 and 6.9 ppm, respectively, and declined to 0.35 and 0.5 ppm in 10 days and to 0.07 and 0.15 ppm in 15 days. Levels on day 10 posed a health hazard. Washing in water reduced levels by 90%. Boiling reduced levels by 91-92%. In some cases the pesticide levels were still higher than the 0.2 ppm allowable concentration. No pesticide was detected in the seeds at harvest.

81-0114. Annapurna, Y.; Rao, P. R. (Mycol. & Plant Pathol. Lab., Dep. Bot., Osmania Univ., Hyderabad 500007, India) **Persistence of spray fungicides on the leaves of *Cicer arietinum* L., (Bengal gram).** *Pesticides* 14(7): 29; 1980 (6 references).

Field studies were designed to determine the persistence of fungicides on the leaf surface and in the leaf tissue of *Cicer arietinum* (Bengal gram). Forty-day-old plants were sprayed with captan (83% wettable powder) and Dithane Z-78 (zineb; 0.2%) with a pump sprayer. Leaf samples were collected on days 2, 5, 13, 27 and 40. Residues on the leaf surface were estimated from leaf washing by solvents. Residues in leaf tissue were determined in washed and ground leaves. Captan persisted for a longer time on the leaf surface; 600 ppm remained after 5 days, compared to 25 ppm Dithane Z-78 after 5 days. Dithane Z-78 was more persistent in leaf tissues; after 5 days 80 ppm remained, compared to 25 ppm captan.

81-0115. Fida, P. (Bundesanst. Pflanzenschutz, Vienna, Austria) **Ergebnisse von Schaedlingsbekaempfungsmittel-Rueckstandsuntersuchungen an Gemuesekulturen unter Glas. [Results of pesticide residue studies on vegetable cultures under glass.]** *Pflanzenarzt* 32(1): 9-11; 1979 (German).

The residue dynamics of pesticides containing benomyl, maneb, zineb, ferbam, dicofol, chlorothalonil, quinomethionate, pyrazophos, mancozeb, diazinon, oxycarboxin, mevinphos and parathion in cucumbers, green peppers, tomatoes, eggplants, string beans and lettuce grown under glass or foil were studied with respect to the maximum allowable residue levels. After the required waiting periods, the residue levels were generally below the maximum allowable residue levels, but higher levels were sometimes found in lettuce sprayed with preparations containing dithiocarbamates during the fall and spring vegetation periods (concentration in spray liquid = 0.2%). An extended waiting period of 4-5 wk was necessary in such cases to reduce the residue levels to below the allowable level of 2 ppm. Three sprayings with a 0.1% spray liquid gave safer residue levels. The dithiocarbamate levels were below the maximum allowable residue levels in cucumbers, tomatoes and string beans harvested after a 4-day waiting period.

81-0116. Pank, F.; Ennet, D. (Versuchstn. Arznei. & Gewuerzpflanzenprod. Bernburg, Pharm. Werk Halle, VEB, DDR-4350 Bernburg, DDR) **Chemische Unkrautbekaempfung in Arneipflanzenkulturen. 2. Metteilung: Spitzwegerich *(Plantage lanceolata* L.). [Chemical weed control in the cropping of medicinal plants. Part 2: Narrow-leaved plantain *(Plantago lanceolata* L.).]** *Pharmazie* 35(8): 494-497; 1980 (11 references) (German).

Prometryne, desmetryne and simazine levels were determined in narrow-leaved plantains *(Plantago lanceolata* L.) from sprayed plantations. Prometryne was used for preemergence treatment in doses of 0.75-3 kg/ha. The residue levels in the harvested plants were 0.1-0.4 mg/kg after treatment with the 3 kg/ha (2 + 1 kg/ha) dose, and < 0.05-0.02 mg/kg after treatment with the lower doses. Desmetryne was applied as soon as the cotyledons had developed fully; the doses applied were 0.2 and 0.6 (0.4 + 0.2) kg/ha. The residue levels in the plants were 0.1 and < 0.05 mg/kg after treatment with the highest dose and < 0.05-0.2 mg/kg after treatment with the 0.2 kg/ha dose. Simazine (0.8 or 2.4 kg/ha) was applied immediately after the first harvest in the first year of cultivation. The residue levels in the second cut were 10.4 mg/kg after treatment with the 2.4 kg/ha dose and 1.5-5.1 mg/kg after treatment with the 0.8 kg/ha dose.

81-0117. Koster, P. B. (Inst. Ration. Suikerprod., Voorburg, The Netherlands) **De bepaling van een aantal schadelijke stoffen in veevoeder-produkten van de suikerindustrie. [Determination of harmful substances in animal feeds from the sugar industry.]** *Polytech. Tijdschr. Procestechniek* 35(9): 535-542; 1980 (32 references) (Dutch).

Methods for the determination of mercury, fluorine and organochlorine pesticides in sugar beet pulp and molasses, and results of determination covering several years, are reported. Gas chromatography after extraction with hexane and pentane and column chromatographic clean-up is used to determine hexachlorobenzene (HCB), α and β-BHC, γ-BHC (lindane), heptachlor, heptachlor epoxide, aldrin, dieldrin, endrin, methoxychlor, p,p'-DDE, p,p'-DDD (p,p'-TDE), p,p'-DDT, and o,p'-DDT. The detection limit is 0.002 mg/kg for HCB and α- and γ-BHC in pulp, 0.005 mg/kg for heptachlor and heptachlor epoxide, 0.008 mg/kg for p,p'-DDE and dieldrin, and 0.016 mg/kg for p,p'-DDD. Only residues of lindane, heptachlor, heptachlor epoxide and dieldrin were found in beet pulp and molasses. The dieldrin, heptachlor and heptachlor epoxide levels have been decreasing since 1973. The lindane residue level had been decreasing until 1976, at which time a steady level was established.

81-0118. Falandysz, J.; Rozycka, B. (Reg. Sanit. Epidemiol. Stn., Gdansk, Poland) **Pozostalosci chlorowanych weglowodorow aromatycznych w maczkach rybnych, maczkach miesno-kostnych, mieszankach paszowych i miesie kurczat brojlerow. [Residues of chlorinated hydrocarbons in fish meal, meat and bone meal, feeds and broiler chicken meat.]** *Rocz. Panstw. Zakl. Hig.* 31(4): 383-387; 1980 (12 references) (Polish).

Determinations of HCB (hexachlorobenzene), ΣDDT and PCBs in fish meal, meat bone meal, feed and chicken meat, produced or available in Poland, were conducted during 1975-1977. In fish meal, the levels of HCB, ΣDDT, and PCBs ranged from 0.005-0.015, 0.22-0.44 and 0.043-0.25 ppm, respectively. Fish meal produced in Poland contained levels of 0.009-0.012, 0.21-0.35 and 0.13-0.22 ppm, respectively, while values for imported fish meal were 0.004, 0.049-0.051 and 0.051-0.17 ppm, respectively. Average levels of ΣDDT and PCB in bone meal samples were 0.074 ppm and trace amounts, respectively. For feeds the average amounts ranged from 0.025 to 0.17 ppm for ΣDDT and from 0.001 to 0.009 ppm for PCBs. Chicken meat contained only trace amounts of PCB and 0.009 ppm ΣDDT.

81-0119. Anderson, A. C.; Abdelghani, A. A.; McDonell, D. (Dep. Environ. Health Sci., Sch. Public Health & Trop. Med., Tulane University, New Orleans, LA 70112) **Screening of four vascular aquatic plants for uptake of monosodium methanearsonate (MSMA).** *Sci. Total Environ.* 16(2): 95-98; 1980 (7 references).

Tests on aquatic plants were performed to determine the nature of the uptake of the herbicide MSMA, which enters water in runoff and by accidental application. Four test species were dosed with 24 μg MSMA/ml and then analyzed weekly for 6 wk. Test water was also analyzed weekly. All plants concentrated MSMA above the background levels. The floating species concentrated more

MSMA (*Lemna minor*, 600 μg/g and *Eichhornia crassipes*, 400 μg/g) than did the rooted species (*Alternanthera philoxeroides*, 200 μg/g and *Hydrophilia lacustris*, 190 μg/g). Bioaccumulation ratios based on exposure to 24 μg/ml and uptake in whole plants (wet wt) were 5, 2, 3 and 2, respectively, for the 4 species. The results clearly indicate that aquatic plants serve as an environmental sink for pesticides.

81-0120. Nakos, G. (Soil Sci. Lab., For. Res. Inst., Terma Alkmanos, Athens 615, Greece) **Effects of herbicides used in forestry on soil nitrification.** *Soil Biol. Biochem.* 12(5): 517-519; 1980 (16 references).

Herbicides used in forestry were examined for their effects on soil nitrification. Soil samples collected from the control plots of field experiments were placed in jars, moistened to 60-70% of their H_2O holding capacity with deionized water, a stock solution of herbicide, and a stock $(NH_4)_2SO_4$ solution to give 100 μg/g NH_4-N. At the beginning and end of the incubation, the soil samples were extracted with KCl for 1 hr, and the filtrates were analyzed for NH_4^+- and NO_3^--N by steam distillation. Of the 10 herbicides tested at practical field rates, only asulam reduced NO_3-N products considerably (> 50%). This is not considered an adverse effect on soil fertility since it helps in conserving N by avoiding leaching and denitrification of NO_3^-.

81-0121. Kutsenogii, K. P.; Makarov, V. I.; Sakharov, V. M. (Author address not given) **Raspredelenie otlozheniya iadokhimikatov na rastitel'nosti i pochve pri obrabotkakh insektitsidnymi aerozoliami. [Distribution of pesticide residues on vegetation and soil after treatments with insecticide aerosols.]** *Tr. Inst. Eksp.* 9: 15-25; 1978 (9 references) (Russian).

The distribution of insecticide residues on soil and vegetation after treatment with insecticidal aerosols was studied. Analysis of residual amounts of DDT and lindane showed that aerosols provided effective pest control with significantly lower residue levels than ground or aerial application. The density of the sediment was found to be directly related to the applied dose.

81-0122. Ivanchenko, V. V. (Author address not given) **Izuchenie dlitel'nosti sokhraneniya fozalona v pochve pri provedenii obrabotok v usloviyakh Saratovskoi oblasti. [Study of the persistence of phosalone in soil after treatments under the conditions of the Saratov Region.]** *Tr. Inst. Eksp.* 9: 68-72; 1978 (20 references) (Russian).

The persistence of phosalone in soil, plants and bodies of water was studied in the Saratov region of the USSR. On day 20 after repeated spraying of an orchard with 0.2% emulsion (2.4 kg/ha), phosalone residues were detected in the 30-40 cm soil layer. Rainfall enhanced elimination of phosalone from the soil and was conducive to its translocation into an adjacent body of water.

See also 81-0003, 81-0004, 81-0005, 81-0006, 81-0007, 81-0009, 81-0022, 81-0034, 81-0042, 81-0124, 81-0126, 81-0127, 81-0128, 81-0135, 81-0140, 81-0154, 81-0155, *and* 81-0156, 81-0157, 81-0175, 81-0184, 81-0236, 81-0243, 81-0265, 81-0285.

81-0123. Bingham, E. (Author address not given) **Pollution in the workplace – control comes slowly.** *Am. Lung Assoc. Bull.* 66(7): 14-16; 1980.

Problems inherent in legislating the prevention of occupational disease are discussed. The situation is compared with the steps taken to eradicate tuberculosis in the early part of the century. Similarities between the two situations include insidious onset, overemphasis of the cost of control measures, and the difficulty of initiating action with no visible connection between hazardous exposure and disease onset. It is emphasized that workplace health problems, like tuberculosis, are community problems. The Kepone (chlordecone) poisoning incident near Richmond, Virginia is discussed. Workers suffered neurological effects and the entire community was affected when the insecticide leached into the James River. The role that lung associations can play in dealing with this type of problem is discussed; education and the formation of coalitions are mentioned.

81-0124. Brungs, W. A.; Mount, D. I. (Natl. Water Qual. Lab., US EPA, Duluth, MN 55804) **Introduction to a discussion of the use of aquatic toxicity tests for evaluation of the effects of toxic substances.** *ASTM STP 657:* pp. 15-26; 1980 (9 references).

The ability of aquatic toxicity tests to determine environmental effects of various chemicals and industrial discharges is discussed. The Office of Toxic Substances and the Office of Pesticide Programs, both within the EPA, are responsible for developing test protocols to provide basic procedures for generating data regarding pesticide hazards. Tests must be made for acute lethality, cumulative mortality and growth effects, chronic effects, effects on the physiological and biochemical aspects of target and nontarget species, behavioral changes, residue analyses, structure/activity and partition coefficients, *in vitro* analyses, algal assays, organoleptic studies, histological effects, microcosms, field studies, diversity changes and benthic toxicity tests. It is noted that, in the case of pesticides, most of the major problems with PCBs, carbon tetrachloride, Kepone (chlordecone), PBBs and dioxins have resulted not from their regular intended uses, but from accidental discharges into the environment. It is therefore suggested that an expectation of carelessness and accidents is needed to estimate realistic environmental exposure to these chemicals.

81-0125. Maki, A. W.; Duthie, J. R. (Environ. Saf. Dep., Proctor & Gamble Co., Cincinnati, OH 45217) **Summary of proposed procedures for the evaluation of aquatic hazard.** *ASTM STP 657:* pp. 153-163; 1980.

In order to more accurately estimate the hazard of pesticides an integrated hazard assessment scheme for pesticide registration was designed. The procedure considers information concerning acute toxicity data, estimated environmental concentrations, observed mammalian/avian reproductive effects, water solubility, half-life and broad large volume use patterns of pesticides. The need for possible additional data is then evaluated including such areas as longer term fish or microinvertebrate chronic testing, bioconcentration studies, or field testing in controlled areas. No provisions currently exist in these tentative hazard evaluation schemes for arriving at ultimate marketing decisions for specific chemicals. The scheme serves only to evaluate the need for additional testing beyond the major identified criteria listed above.

81-0126. Subcomm. E35.21 Saf. Man & Environ., ASTM, Philadelphia, PA 19103 **Proposed working document for the development of an ASTM draft standard on standard practice for a laboratory testing scheme to evaluate hazard to non-target aquatic organisms.** *ASTM STP 657:* pp. 202-237; 1980 (22 references).

A stepwise laboratory testing scheme is described to develop data to aid in evaluating the hazard to nontarget aquatic organisms through the intended and non-intended release of pesticides into the environment. Acute aquatic toxicity testing and acute hazard assessment; growth, reproduction and chronic effects (test description, selection and assessment); bioconcentration/biomagnification (testing and assessment); and overall hazard assessment are discussed. In the case of pesticides, the geographic usage areas must be considered in evaluation of environmental hazards due to their interrelationships with soil, temperature, rainfall and other environmental factors. The physical form of the chemical must also be known, as well as the method of application. Potential routes of the chemical to water must be understood.

81-0127. Aquat. Hazards Pestic. Task Group, Am. Inst. Biol. Sci., Arlington, VA **Criteria and rationale for decision making in aquatic hazard evaluation (third draft).** *ASTM STP 657:* pp. 241-273; 1980 (35 references).

This report arose from a request from the US EPA Office of Pesticide Programs, Criteria and Evaluation Division, and is an attempt to review and analyze existing information concerning test protocols and methods designed to evaluate aquatic hazard testing to facilitate pesticide registration. Specific topics discussed in the review include criteria and rationale used for judging the adequacy of basic toxicity data, the scheme and rationale for use of criteria in hazard evaluation, and recommended conditional or intermediate test methods. Means of interpreting acute median lethal toxicity data, environmental concentration data, use data, half-life data, and avian, mammalian and efficacy data are discussed.

81-0128. Spiegelhalder, B.; Preussmann, P. (Dtsch. Krebsforsch., Heidelberg, BRD) **Occupational exposure to**

***N*-nitrosamines.** *Cancer Detect. Prev.* 3(1): abstract 037; 1980 (2 references).

Workers involved in the manufacture or use of amine pesticides are at risk of exposure to *N*-nitrosoamines. Industrial products and chemicals and the air in various workplaces were investigated to determine the origin and formation of nitrosamines in the work areas. The nitrosating agent can be nitrite, nitrogen oxides or transnitrosating agents such as nitrosodiphenylamine. Results on biological monitoring are included in the report. [Presented at 4th Int. Symp. on Prevention and Detection of Cancer.]

81-0129. Grice, H. C. (Int. Life Sci. Inst., Ottawa, Ontario, Canada) **Toxicity testing.** *Cereal Foods World* 25(10): 652-655; 1980.

Aspects of toxicity testing are discussed, including short term and chronic tests. The need for uniform guidelines in conducting chromosomal or genetic effect tests is stressed. Basic research, conducted to provide information on maximum tolerated doses, is an important step in forming these guidelines. Future toxicity testing, such as pharmacological effects of high dosages of toxicants, and other studies that produce results that could be extrapolated to humans, are also discussed. Preventive or protective toxicology solutions to contamination of food products by pesticides are outlined. Fruits and vegetables which have become contaminated with dithiocarbamate fungicides or ethylene thiourea can be washed in hypochlorite to remove the residues. Poultry product contamination by woodshavings containing PCP + dioxin can be reduced by alterations in the PCP distillation process. Cereals and rice can contain 2,4,5-T + dioxin. A hexane wash, introduced during 2,4,5-T synthesis, would reduce this contamination.

81-0130. Handler, P. (Author address not given) **Some comments on risk assessment.** *Clean Air (Heidelberg, Aust.)* 14(2): 28-30; 1980.

A general discussion on the role of government in protecting the public from chemicals in the environment is presented. The acute toxicity of many new synthetic chemicals is generally adequately tested, but chronic effects are rarely assessed. This is emphasized by past experiences with vinyl chloride, asbestos, Kepone (chlordecone), organophosphorus pesticides, and dioxin. Government regulation of these substances, DDT, various other pesticides, PCBs, diethylstilbesterol (DES), and food additives, are among the materials examined by the US National Research Council in attempts to estimate the environmental and health hazards associated with the use of these compounds. Guidelines are needed to determine whether given technological benefits are worth the attendant risks. Reliable quantitative assessments of costs, risks, and benefits are generally not available and risk assessment is, therefore, not easily quantifiable.

81-0131. Ficarra, B. J. (Dep. Emerg. Med., Lawrence Hosp., Bronxville, NY 10708) **Toxicologic states treated in an emergency department.** *Clin. Toxicol.* 17(1): 1-43; 1980 (66 references).

Some of the problems most frequently seen in hospital emergency departments are discussed. The problem of ethylene oxide induced illness is considered. A case of flu-like symptoms attributed to ethylene oxide in personnel of a Minnesota hospital is presented. It was found that a machinery design flaw allowed ethylene oxide gas to escape at 50-80 fold allowable concentrations. Other reported symptoms of ethylene oxide poisoning include skin burns, blistering, frostbite from the liquified gas, coughing, vomiting, irritation of the eyes, nose and throat, headache, nausea, dyspnea, pulmonary edema, drowsiness and weakness. It is estimated that hundreds of thousands of people may be exposed to the hazards of ethylene oxide. It is concluded that more stringent FDA guidelines are inevitable.

81-0132. Tomova, L. (Reg. Dermato. Venerol. Dispens., Sofia, Bulgaria) **Diagnostichna stoinost na epikutannoto testuvane pri selskostopanskite rabotnitsi – rastenivudi raboteshti s pestitsidi. [Diagnostic value of epicutaneous testing of agricultural workers – plant-growers working with pesticides.]** *Dermatol. Venerol. (Sofia)* 18(3): 161-164; 1979 (11 references) (Bulgarian).

Dermatological examinations were conducted on 405 agricultural workers who had been exposed to pesticides. The workers had used 11 different pesticides under field conditions. Allergic concentrations of the active ingredients were selected after testing 100 control individuals. Sensitization in professionals was evident for fundazol, zozanex, TMTD (thiram) and Dipterex (trichlorfon).

81-0133. Tomova, L. (Dist. Dermatovenerol. Dispensary, Sofia, Bulgaria) **Osobenosti pri razvitieto na kozha svrukhchuvstvitelnost spryamo pestitsida fundazol. [Characteristics of skin sensitivity to the pesticide fundazol.]** *Dermatol. Venerol. (Sofia)* 18(3): 164-168; 1979 (15 references) (Bulgarian).

The dermatological examination of 32 men and 231 women occupationally exposed to fundazol in hothouses revealed skin diseases in 36.1% of the workers, including noncommunicable occupational skin affections in 28%. Epicutaneous testing with 2% fundazol in white petroleum was performed in 162 exposed workers and 160 unexposed controls. The skin tests were positive within 24-72 hr in 17/162 workers and in 0/160 controls. The findings indicate allergenic properties of fundazol.

81-0134. Caudarella, R.; Raffi, G. B.; Gennari, P.; Boari, C.; Baldi, E. (Ist. Patol. Med. II., Cent. Antiveleni,

Univ. Bologna, Bologna, Italy) **Valutazione di alcuni indici di funzionalite epatica in un gruppo di lavoratori cronicamente esposti ad agenti antiparassitari. Nota II. [Evaluation of some hepatic and renal function indices in a group of workers chronically exposed to pesticides. Note II.]** *G. Clin. Med. (Bologna)* 60(2): 120-126; 1979 (15 references) (Italian).

Parameters of renal function were studied in 58 workers occupationally exposed to pesticides. The workers were age 23-61 yr. The length of the occupational exposure was 10.9 ± 6.6 yr. The parameters tested included endogenous creatinin clearance, creatininemia, creatininuria, azotemia, serum cholinesterase, natremia, natriuria, potassemia, postassiuria, choloruremia, chloruria, calciemia, phosphorus levels in blood and urine, and plasma osmolarity. Only the endogenous creatinin clearance showed a slight decrease, especially in workers primarily exposed to organophosphorus pesticides (70.5 ± 10.80 ml/min versus 78.50 ± 22.50 in workers exposed to both organophosphorus pesticides and other preparations, and 88.00 ± 23.00 ml/min in workers exposed mainly to preparations in dust form).

81-0135. Makarian, A. S. (Armenian Branch All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Erevan, USSR) **K obosnovaniyu gigienicheskikh normativov metazina v pishchevykh produktakh i v vode vodoemov. [Substantiation of hygienic standards of metazin in food products and bodies of water.]** *Gig. Sanit.* 45(8): 74-75; 1980 (5 references) (Russian).

An attempt was made to determine the permissible residual amounts (PRA) of the symm-triazine herbicide metazine in food products and the maximum permissible concentration (MPC) of metazine in bodies of water. Chromatographic analysis of potato and soil samples after metazine application (1-4 kg/ha) did not show the presence of herbicide residues. Metazine did not have negative effects on the quality of potato. Specific odor in water was recorded at a metazine concentration of 39-98 mg/l. Specific taste in water was recorded at a concentration of 404-1003 mg/l. Metazine at 0.2, 2.0 and 20.0 mg/l stimulated growth and development of saprophytic microflora in the water. Analysis of acute toxicity of metazine showed that the LD50s for mice and rats were 1894 and 550 mg/kg, respectively. In chronic, 10-mo experiments, metazine, at 3.4 and 1.7 mg/kg, caused functional changes in the nervous system and changes of the morphological composition of the peripheral blood. The recommended PRA and MPC of metazine are 0.05 mg/kg and 0.4 mg/l, respectively.

81-0136. Shpirt, M. B.; Abdashimov, K. A. (Kirgiz Res. Inst. Epidemiol. Microbiol. & Public Health, Frunze, USSR) **Allergennye svoistva tabachnoi pyli. [Allergenic properties of tobacco dust.]** *Gig. Sanit.* 45(9): 15-19; 1980 (24 references) (Russian).

In an attempt to evaluate whether pesticides used in tobacco growing play a certain role in the etiology of allergoses, the immunity state of 608 tobacco growers was studied. Markedly positive reaction of specific leukocytes agglutination was recorded in 89.7% of the workers. Positive reaction with tobacco antigen was detected in 61.8% of the workers. Similarly, positive reactions to pesticide antigen [HCCH (BHC) and metaphos (methyl parathion)] were detected in 57.0% and 63.2%, respectively.

81-0137. Walker, B., Jr. (Author address not given) **Challenges of the 80's.** *J. Environ. Health* 43(2): 69-73; 1980.

The history of job safety is briefly reviewed and the role of OSHA in job safety is discussed. The hazards of toxic substances to the public, with regard to waste disposal and high-level pesticide use are considered. These materials include TCDD, Kepone (chlordecone) and DBCP (dibromochloropropane) . Toxicological investigation is discussed, in which various aspects from field research to legal factors are covered. The needs of workers in the public health field are reviewed and the need for reforms in this field, at all levels, from education to legislation, are discussed.

81-0138. Gupta, G. C. (Dep. Chem. & Environ. Sci., Univ. Maryland, Princess Anne, MD 21853) **Use of water hyacinths in wastewater treatment.** *J. Environ. Health* 43(2): 80-82; 1980 (30 references).

A review of the use of water hyacinths in wastewater treatment is presented. The capabilities of nitrogen and phosphorous removal are discussed, and examples of the use of this plant in oil refinery effluent holding ponds and sewage ponds are presented. The use in lowering BOD in sewage ponds, removing heavy metals from industrial discharges and removing trace toxics and pesticides from chemical, photographic and agricultural wastewaters is described. The factor limiting the growth of water hyacinths, including temperature, salinity, dissolved oxygen, and harvesting are discussed.

81-0139. El-Araf, A.; Baca, T. E. (Dep. Health Sci. & Human Ecol., California State Coll., San Bernardino, CA 92407) **The administration of state and local environmental health programs. Who is responsible?** *J. Environ. Health* 43(2): 86-100; 1980 (2 references).

Trends in state organizations charged with administrating environmental health programs are reviewed. Many changes have arisen in the structure of such organizations since their beginnings in the 1960s. The structures in current times range from comprehensive units in which most environmental programs are connected to a single department to fragmented approaches where various

agencies and departments are involved in individual efforts for environmental health and safety. Several examples of the types of organizations active today are given, including programs in California, Oregon, New Mexico and Pennsylvania. It was recommended from this study that the scope of environmental health management be defined to include all programs addressing environmental degradation and preservation and those relating to impact on the health, safety, comfort and economic well being of man. The creation of a Federal Environmental Health Administration or a Comprehensive Department of Environment and Public Health at the national level is encouraged.

81-0140. Aaronson, M. J.; Tessari, J. D.; Savage, E. P.; Goes, E. A. (Colorado Epidemiol. Pestic. Stud. Cent., Colorado State Univ., Fort Collins, CO 80523) **Determination of aldicarb sulfone in hydroponically grown cucumbers.** *J. Food Saf.* 2(3): 171-181; 1980 (10 references).

Two outbreaks of illness in a Nebraska community are described. Several persons became violently ill after ingestion of hydroponically grown cucumbers. The vegetables were extracted with acetone and chloroform (1:1), eluted on a florisil column, and the concentrated extracts analyzed by gas chromatography using a flame photometric detector. It was determined that aldicarb sulfone, an aldicarb metabolite, was present in the cucumbers. Concentrations ranged from 7 to 11 ppm aldicarb. It was concluded that the water and gravel in the hydroponics system were contaminated with aldicarb.

81-0141. Lipshultz, L. I.; Ross, C. E.; Whorton, D.; Milby, T.; Smith, R.; Joyner, R. E. (Div. Urol., Dep. Surg., Med. Sch., Univ. Texas, Houston, TX) **Dibromochloropropane and its effect on testicular function in man.** *J. Urol.* 124(4): 464-468; 1980 (16 references).

Two hundred twenty-eight workers exposed to dibromochloropropane at 2 chemical production sites were studied for possible changes in testicular function. At each production site exposed workers exhibited greater concentrations of follicle-stimulating hormone in the serum than did the non-exposed workers. This increased concentration decreased by 10 levels of magnitude when employees experiencing shorter but more recent exposure were compared to those with longer exposure histories. At the production site where exposure had been recent and of relatively short duration significant changes in sperm density were noted when exposure exceeded 100 hr (adjusted). At the plant with a longer history of exposure a significant impairment was noted only at exposure levels above 100 adjusted hr. It is suggested that regenerative changes in the testes occur once the gonadotoxic substance has been removed.

81-0142. Tiuriukanova, G. K.; Anan'eva, N. D.; Sokolov, M. S.; Primak-Miroliubov, V. N. (Inst. Agrochem. & Soil Sci., Moscow, USSR) **Deistvie gamma-izlucheniia na vodnye rastvory propanida anilinov. [Effect of gamma radiation on aqueous solutions of propanide and anilines.]** *Khim. Sel'sk. Khoz.* 18(9): 51-54; 1980 (14 references) (Russian).

To determine whether gamma irradiation can be used for purification of waste and irrigation waters from herbicide residues, aqueous solutions of propanide (3,4-dichloropropioanilide), 3,4-dichloroaniline, 4-chloroaniline, 3-chloroaniline, 2-chloroaniline, and aniline were irradiated with gamma rays or UV. The measurements showed that radiolysis of propanide and chloro-substituted anilines is the reaction of the first order. The least stable were 2-CA and propanide. The degree of radiolysis depended upon the molecular weight of the compound.

81-0143. Kondo, K.; Ishimaru, O.; Tashiro, N.; Yamaguchi, E.; Kimura, T.; Matsui, I. (First Dep. Intern. Med., Obinhiro Kosei Hosp., Obihiro, Hokkaido, Japan) **[Results of epidemiological investigation on pesticide induced accidents in Tokachi District of Hokkaido.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(3): 536-537; 1980 (Japanese).

A survey was conducted on 7512 farmers from 12,000 owner-operated farms in the Tokachi District. Pesticides were handled by 921 men and 439 women (total of 1360 individuals). In their responses to the questionnaire, 20.5% (220 men and 59 women) stated that they had experienced symptoms of pesticide effects. The number of pesticide applications reached a maximum of 20 in men and 10 in women. Pesticide side effects were noted 6 or more times in 11 of the men, and 5 times or less in 209. Among the intoxicated individuals, 43% continued working, and 53% were not treated. Only 13% of the intoxicated individuals received a physician's care. Subjective symptoms included headache in 24.5%, nausea and general fatigue in 20%, and dizziness and skin rash in 10% each. Only a few instances of central nervous system symptoms were seen. A general carelessness about pesticide application protection was noted for the women respondents, including a lack of consideration of physical condition prior to application, handling pesticides without using gloves, and failure to change clothing after pesticide application.

81-0144. Shiaku, K.; Torri, M.; Hirai, K. (Sch. Parasitol., Fac. Med., Ehime Univ., Matsuyama, Ehime, Japan) **[Alteration of examined blood-biochemical values accompanying the application of an organophosphorus insecticide, mecarbam.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(3): 538-539; 1980 (2 references) (Japanese).

Blood specimens were collected and analyzed from farmers before and after applying mecarbam (together with

an organosulfur fungicide) for the first time. Serum cholinesterase, determined by the method of Voss, showed a significant ($p = 0.05$) reduction after mecarbam application, especially in women who applied more than 2 *l* of 50% EC. However, the reduction was smaller than the variation of ChE values in individuals who did not apply pesticides. No change was observed in the erythrocyte ChE activity according to the method of Bellino. Nonspecific esterase was not reduced, nor was an increase noted in beta-glucuronidase or alkaline phosphatase. No change in total cholesterol or HDL-cholesterol attributable to mecarbam was observed. In view of the great variations in cholinesterase levels in non-pesticide applicators, and the small change after mecarbam application, the toxicity of mecarbam cannot be evaluated via the cholinesterase values. The degree of exposure to mecarbam also cannot be assessed by cholinesterase measurement.

81-0145. Mito, K.; Hayashi, Y.; Dallimunthe, D.; Tsubota, M.; Hara, H.; Kawate, R.; Nishimoto, S.; Takashina, N. (Dep. Intern. Med., Hiroshima Gen. Hosp., Hiroshima, Japan) **[Results of clinical examination of persons engaging in crop cultivation in greenhouses as compared to the results for persons engaging in crop cultivation in open fields.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(3): 542-543; 1980 (Japanese).

Effects of various pesticides were investigated on workers cultivating crops in greenhouses covered with polyvinyl chloride film. The 35 men and 39 women in the greenhouse group were compared with 24 men and 34 women cultivating crops in open fields in tests conducted in April of 1977, 1978 and 1979. The rate of positive results from the occult blood tests in urine was higher in the greenhouse workers; however, the number of cases in which a positive urine occult blood test was obtained twice did not differ between the two groups. The rate of positive occult blood findings in the feces was higher in both groups, but two positive results were not obtained in the occult blood tests in individuals from either group. No difference in EKG readings was obtained between the two groups in terms of the frequency of I 1-3, IV 1-3 or V 1-3. GOT, GPT and ChE abnormalities were seen in a larger percentage of the greenhouse group than among the fieldworkers, but the degree of abnormality in the case of GOT and GPT was low. The incidence of abnormalities of WBC, RBC and hemoglobin did not differ between the two groups. In each of the years examined, the 50 g oral glucose tolerance test showed no differences between groups.

81-0146. Asano, Y.; Yoshida, K. (Author address not given) **[Effectiveness and limitations of hemoperfusion in patients intoxicated by paraquat dichloride.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(3): 544-545; 1980 (Japanese).

Case histories of 23 patients treated for paraquat intoxication are surveyed. Out of 15 cases in which direct hemoperfusion was performed, 5 patients survived; of 8 cases in which direct hemoperfusion was not performed, 2 survived. The prognosis was poor for patients who had ingested large amounts of paraquat, even those who showed a favorable general condition at the time of examination. All of those who showed a highly positive urinary paraquat reaction died. All the individuals who survived direct hemoperfusion had been treated initially by gastric lavage, administration of an adsorbent, administration of a laxative, and forced diuresis within 6 hr after poison ingestion. Direct hemoperfusion was started within 20 hr of poison ingestion in the individuals who survived. Renal and hepatic disturbances were slight in the survivors. The causes of early death were acute renal failure due to shock, gastrointestinal hemorrhage, and/or respiratory failure. Death in later stages was due primarily to respiratory failure. Direct hemoperfusion was not performed in patients hospitalized more than two days after paraquat ingestion and giving a weakly positive urine reaction; only the basic initial treatment was given. Two such patients survived, presumably because of the small amount of paraquat ingested and the elimination of paraquat from the body, resulting in low blood levels. The limitations to the value of treatment in paraquat intoxication seem to be represented by the ingestion of large amounts of paraquat and a long time lapse between paraquat ingestion and treatment, even if the amount taken was small.

81-0147. Anonymous **Velsicol concludes 30-year chlordane exposure study.** *Occup. Health Saf.* 49(9): 8; 1980.

An independent epidemiologic study was conducted at the Velsicol plant in Marshall, Illinois, to detect any possible adverse effects on employees due to exposure to chlorinated hydrocarbon insecticides over the past 34 yr. Employees who worked at the plant for at least 3 mo during the period 1946-1980 were studied (783 persons). No evidence of any long term health effects was found. It is concluded that the results support earlier evidence of no increased prevalence of cancer in chlordane manufacturing workers.

81-0148. van Tiel, N. (Plant Prot. Serv., Wageningen, The Netherlands) **Activities of the FAO/WHO Codex Alimentarius Commission in the field of pesticide residues.** *Pesticides* 14(7): 10-15; 1980 (8 references).

Some of the activities of the Food and Agriculture Organization of the United Nations (FAO), working jointly with the World Health Organization (WHO) in the establishment of internationally acceptable standards for foods, are discussed. The FAO/WHO Codex Alimentarius Commission was established in 1963, and one of its committees (CCPR) was charged with establishing tolerances for pesticide residues in foods. In addition to making Acceptable Daily Intake (ADI) decisions on pesticides elected

according to agreed priorities, the Committee has also developed basic principles for good agricultural practice. In addition to considering ADI's for various pesticides, the Committee is also responsible for recommending maximum residue limits for each individual pesticide on each food crop allowed, and making recommendations on methods for chemical analysis. The compatibility of recommended maximum residue limits with the ADI figures are then critically examined. The procedures and administration details involved in the Committee's work are described, along with the impact it has had on pesticide regulation, especially in developing countries.

81-0149. Wagner, N. (Dermatol. & Allergol. Abt., Staedtisch. Krankenhaus., Muenchen-Schwabing, BRD) **Berufsbedingte Hauterkrankungen. [Occupational skin diseases.]** *Therapiewoche* 30(3): 5344-5350; 1980 (27 references) (German).

Seven to 8% of all suspected skin diseases reported in 1979 in the BRD were classified as occupational diseases, constituting about 23% of all occupational diseases recognized by the BRD health insurance authorities. Fifty percent of occupational dermatoses are not reported until 3 yr after the beginning of the aliment. The Occupational Disease Insurance Ordinance sets up criteria and categories for the classification of occupational illnesses. Pesticide-related skin afflictions may be found under the category of diseases caused by arsenic and its compounds, ranging from disseminated keratosis on the hands and feet to multiple basaliomas or Bowen's disease. The category of diseases due to halogenated hydrocarbons includes chloracne, caused among other things by TCDD (dioxin). Outbreaks of chloracne have been reported from herbicide and antimicrobial manufacturing plants in Europe and the United States. Chloracne is the most noticeable manifestation of TCDD poisoning, but systemic effects also occur.

See also 81-0001, 81-0003, 81-0004, 81-0006, 81-0007, 81-0009, 81-0027, 81-0028, 81-0035, 81-0042, 81-0049, 81-0051, 81-0052, 81-0062, 81-0063, 81-0065, 81-0067, 81-0068, 81-0087, 81-0155, 81-0175, 81-0183, 81-0192, 81-0202, 81-0233, *and* 81-0239.

81-0150. Holsapple, M. P.; Schnur, M.; Yim, G. K. W.* (Dep. Pharmacol. & Toxicol., Sch. Pharm. & Phar. Sci., Purdue Univ., West Layfayette, IN 47907) **Pharmacological modulation of edema mediated by prostaglandin, serotonin and histamine.** *Agents Actions* 10(4): 368-373; 1980 (21 references).

Studies were presented in which the effects of chlordimeform (CDM) on albumin-induced edema was investigated. Male rats were given ip injections of CDM (35 mg/kg), aspirin (162 mg/kg) or SC-19220 (50 mg/kg), or oral doses of cyproheptadine (3 mg/kg). Within 30-60 min of treatment, 0.1 ml of 1% carrageenin or 0.1 ml of undiluted fresh egg albumin was injected into the hind paw. Subsequent edema was measured by mercury displacement. In other rats, 0.1 ml of 10 mg/ml histamine HCl was injected into the left hind paw and 0.1 ml of 0.05 mg/ml serotonin creatinine sulfate was injected into the right hind paw of the same animal. Swelling was measured at 1 and 3 hr after carrageenin, at 11 hr after albumin, and at 30 min after 5HT or histamine. Another group of rats was bilaterally adrenalectomized, then given 0.9% NaCl for 7 days prior to testing with ip CDM. In another group of rats, CDM and aspirin were administered locally into the paw with carrageenin. CDM and cyproheptadine both antagonized edema induced by albumin and by 5HT and histamine. Aspirin and SC-19220 had no effects. Cyproheptadine reduced the 5HT and histamine-induced phase, but aspirin and SC-19220 reduced the PG phase of carrageenin-induced edema. It is concluded that CDM possesses multiple acute anti-inflammatory actions not exhibited by aspirin, SC-19220 or cyproheptadine.

81-0151. Anderson, M. S.; Dutton, M. F.* (Dep. Life Sci., Trent Polytech., Nottingham NG1 4BU, England) **Biosynthesis of versicolorin A.** *Appl. Environ. Microbiol.* 40(4): 706-709; 1980 (15 references).

Studies were performed to determine the biotransformation pathway for the conversion of versicol hemiacetal acetate (VHA) to versicolorin A (VA) and the relationship of this conversion to the formation of aflatoxin B_1. The effect of dichlorvos on the conversion mechanism were examined in cell-free extracts of *Aspergillus parasiticus.* Dichlorvos was added to the cell-free extracts at 5, 10, 20 and 50 μg/ml and the liberation of *p*-nitrophenol (0.020, 0.012, 0.003 and 0.001 μmol/mg protein/min, respectively) indicated a dose-dependent effect on aryl esterase activity. Oxygen uptake by the cell-free preparations was reduced from 0.75 to 0.15 μl O_2/min by the addition of dichlorvos at 20 μg/ml. Dichlorvos did not, however, inhibit the conversion of versicolorin A hemiacetal acetate (VAAC) and versicolorin A hemiacetal (VAOH) to VA in the cell-free extracts.

81-0152. Lee, S. H. S.; Laltoo, M.; Crocker, J. F. S.; Rozee, K. R.* (Dep. Microbiol., Dalhousie Univ., Halifax, Nova Scotia B3H 4H7, Canada) **Emulsifiers that enhance susceptibility to virus infection: increased virus penetration and reduced interferon response.** *Appl. Environ. Microbiol.* 40(4): 787-793; 1980 (16 references).

An emulsifier (used in pesticide formulations) which had an environmental relationship to Reye's syndrome, when used to treated L-929 cultures, was shown to increase the rate of encephalomyocarditis virus penetration and uncoating while having no effect on the attachment of virus or on the replication of infectious ribonucleic acid. This treatment also rendered L-929 cells unable to respond normally to interferon inducers and reversed an already established interferon antiviral state. It is proposed that one or more of these actions result in the cellular enhancement of virus susceptibility. (Author abstract by permission)

81-0153. Brandt, I.; Hoegman, P. G. (Dep. Pharmacol., Fac. Vet. Med., Swedish Univ. Agric. Sci., Biomed. Cent., S-75123 Uppsala, Sweden) **Selective binding of aldrin and dieldrin in cartilage.** *Arch. Toxicol.* 45(3): 223-226; 1980 (12 references).

Whole body autoradiography of ^{14}C-aldrin and ^{14}C-dieldrin in pregnant mice indicated a slow but persistent uptake of both substances in cartilage, e.g. in the vertebral and epiphyseal discs. Also in the fetal skeleton a marked accumulation was observed. (Author abstract by permission)

81-0154. Hansen, D. J.; Tagatz, M. E. (Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **A laboratory test for assessing impacts of substances on developing communities of benthic estuarine organisms.** *ASTM STP 707:* pp. 40-57; 1980 (47 references).

A bioassay technique for assessing impacts of pollutants on benthic estuarine organisms was described. The test apparatus consisted of ten adjacent aquaria containing 6 cm of sand covered with 3 cm of seawater containing plankton. As colonization occurred, toxicants were generally pumped into the tanks by way of a constant-head box which maintained sea water flow-through and toxicant dilution rates. After 8 and 16 wk of exposure, the animals were collected and identified and the numbers, species and phyla of the animals that grew from the planktonic larvae in control tanks were compared to those that grew in treatment tanks. Aroclor 1254 at 6.7 μg/l for 4 mo resulted in a significantly decreased number of total species and numbers of individuals of the phylum Arthropoda. Toxaphene resulted in some increased individuals of Annelida, but no significant decreases of species or individuals. Seventy-six μg pentachlorophenol (PCP)/l resulted in reduced total species and total individuals. Treatment with 15.8 μg Dowicide G-ST/1 (79% Na-PCP) reduced the numbers of individuals after 13 wk. Barite (94-96% $BaSO_4$) mixed in the sand at a ratio of 1:3 caused reduced numbers

of species, principally of the phylum Annelida. Drilling mud at a ratio of 1:10 (mud to sand) caused reductions in the total individuals. This test is valuable in assessing community responses to pollutants and substances that physically alter the substrate.

81-0155. Bishop, W. E.; Maki, A. W. (Environ. Saf. Dep., Ivorydale Tech. Cent., Procter & Gamble Co., Cincinnati, OH 45217) **A critical comparison of two bioconcentration test methods.** *ASTM STP 707:* pp. 61-77; 1980 (15 references).

Studies were performed to compare 2 methods (kinetics and plateau) for testing bioconcentration of several contaminants, including DDT, in bluegill sunfish. Bioconcentration potential is an important aspect of environmental hazard assessment for many chemicals. Calculations of ^{14}C retention were used to predict whole-body equilibrium bioconcentration factors (BCF). The BCF values from short-term kinetic experiments were compared to BCF values from individual 28-day plateau tests. DDT had the highest BCF value (compared to EDTA and 2 types of surfactants). Although the kinetics method has certain operational advantages (less test material and shorter exposure time), both methods are adequate to describe bioconcentration of a wide variety of chemicals.

81-0156. Veith, G. D.; Macek, K. J.; Petrocelli, S. R.; Carroll, J. (Environ. Res. Lab., US EPA, Duluth, MN 55804) **An evaluation of using partition coefficients and water solubility to estimate bioconcentration factors for organic chemicals in fish.** *ASTM STP 707:* pp. 116-129; 1980 (16 references).

Studies were performed which led to the development of a rapid, low cost means of estimating bioconcentration factors and partition coefficients for organic chemicals. Bioconcentration potential is important in hazard evaluation, especially for chemicals such as DDE and PCBs. Laboratory studies were performed on 28 chemicals to determine bioconcentration factors (BCF), water solubilities, and n-octanol-water partition coefficients (P). Linear regression analysis resulted in the equation $\log BCF = 0.76 \log P - 0.23$ which could then be used to estimate BCF when P is known. The estimated values (at a cost of $200/chemical) differed by 7.2% from the laboratory measurements (which cost $1000).

81-0157. Bailey, H. C.; Liu, D. H. W. (Aquat. Toxicol. Lab., Toxicol. Dep., SRI Int., Menlo Park, CA 94025) ***Lumbriculus variegatus*, a benthic oligochaete, as a bioassay organism.** *ASTM STP 707:* pp. 205-215; 1980 (8 references).

Studies were performed to evaluate a freshwater oligochaete for use as a bioassay organism. *Lumbriculus variegatus* were cultured in 19 *l* aquaria under flow-through conditions at an initial stocking density of 190 g/tank. Acute toxicity tests were then performed on 4 replicates, 5 worms each, in 200 ml of test medium. Tests on other organisms were also run. Seven pesticides [malathion, 2,4-D, Sevin (carbaryl), chlordane, methoxychlor, Treflan (trifluralin) and DDT] were used in the bioassays, along with a series of heavy metals, and munitions wastewater. The sensitivity of the oligochaete to all compounds, except the pesticides, was comparable to that of other test organisms. This easily cultured freshswater oligochaete demonstrates many sublethal responses and is a potential test organism for non-pesticide pollutants. *L. variegatus* appears to be much less sensitive to pesticides than other invertebrates.

81-0158. Smith, A. D.; Griffith, T. J.; Orr, D. E.; Ozburn, G. W. (Dep. Biol., Lakehead Univ., Thunder Bay, Ontario P7B 5E1, Canada) **Assimilation efficiency and clearance of trichlorobenzenes in rainbow trout.** *ASTM STP 707:* pp. 216-223; 1980 (14 references).

Trichlorobenzenes (TCBs) are used as pesticide solvents, and are also degradation products of the insecticide γ-BHC (lindane). The nature of assimilation and clearance of trichlorobenzenes in trout was studied. ^{203}Hg label was added to TCB and mixed into a commercial trout food which was fed at a rate of 0.5 g/10 g body wt. A series of whole body counts were performed on a subgroup of fish to estimate void times. An additional subgroup was analyzed for TCB at 79, 102, 174, 238 and 389 hr postdose. A dose of 50 ppm TCB was only 61% assimilated. Clearance of over 90% of the TCB was observed within 174 hr postdose.

81-0159. Seyfried, P. L. (Dep. Microbiol. & Parasitol., Univ. Toronto, Toronto M5S 1A1, Canada) **Heavy metal resistance in aquatic bacterial isolates.** *ASTM STP 707:* pp. 224-232; 1980 (35 references).

Studies are presented which describe the resistance of bacteria to heavy metals. Two hundred and sixty strains of *Pseudomonas aeruginosa* were isolated from Lake Ontario, two sewage treatment plants, Muskoka and Kowantha lakes (Ontario), and from a series of swimming pools. The bacteria were then exposed to mercuric chloride ($HgCl_2$), cadmium chloride ($CdCl_2$), sodium arsenate ($Na_2HAsO_4 \cdot 7H_2O$) and lead nitrate [$Pb(NO_3)_2$] dissolved in distilled water and added to sterile media in designated concentrations. All were resistant to 1000 μg/ml arsenic and lead, and 97% were resistant to 400 μg/ml cadmium. Fifty-four percent of the isolates were sensitive to mercury at concentrations > 10 μg/ml. The results indicate that there is considerable variation in the resistance of bacteria strains to metals and that bioassays should be performed on isolated strains and not clinical strains.

81-0160. Ward, G. S.; Parrish, P. R. (EG&G Bionomics Mar. Res. Lab., Pensacola, FL 32507) **Evaluation of early life-stage toxicity tests with embryos and juveniles of sheepshead minnows *(Cyprinodon variegatus).*** *ASTM STP 707:* pp. 243-247; 1980 (15 references).

A review is presented which evaluates toxicity tests on embryos and juveniles of sheepshead minnows. Nine early-stage tests, 8 chronic, and 1 partial chronic test, which involved pure chemicals, pesticides, industrial wastewater, and an organometallic materials were reviewed. Growth of the minnows during early life-stage tests was not a sensitive indicator of effect in 16 of 18 tests surveyed, but juvenile mortality was found to be a good indicator. Mortality had occurred by day 14 after hatching, and it was recommended that the tests be shortened to 14 days to reduce the cost and time of testing.

81-0161. Rodgers, J. H.; Cherry, D. S.; Graney, R. L.; Dickson, K. L.; Cairns, J. (Inst. Appl. Sci., North Texas State Univ., Denton. TX 76203) **Comparison of heavy metal interactions of acute and artificial stream bioassay techniques for the Asiatic clam *(Corbicula fluminea).*** *ASTM STP 707:* pp. 266-280; 1980 (19 references).

Control of the Asiatic clam, *Corbicula fluminea,* with heavy metal exposure is discussed. Studies were conducted to compare artificial stream bioassays for differences in heavy metal interactions. Samples of the asiatic clam, taken in the field, were subdivided for bioassays and analysis for 40 elements. Static and continuous flow bioassays were used to test for Cu^{++} and Zn^{++} toxicities alone, and in combination. The 96-hr static bioassay LC50 for Cu^{++} was 0.04 ppm, and 6.04 ppm for Zn^{++}. Both metals together resulted in an LC50 of 0.05 ppm. Artificial stream LC50 values were 0.49 ppm for Cu^{++} and 3.06 ppm for Cu^{++} plus Zn^{+}. Analysis of samples indicated that bioaccumulation was higher in the visceral tissues than in valves. Accumulation of Cu^{++} as high as 275-400 ppm resulted in physiological stress evident as gaping and lack of filtering. These mechanisms are probably responsible for the high tolerance of the clams to metals.

81-0162. Rand, G. M.; Barthalmus, G. T. (Corp. Health, Hooker Chem. Co., Niagra Falls, NY 14302) **Use of an unsignaled avoidance technique to evaluate the effects of the herbicide 2,4-dichlorophenoxyacetic acid on goldfish.** *ASTM STP 707:* pp. 341-353; 1980 (11 references).

Studies were performed to determine the effects of 2,4-D on goldfish. An unsignaled avoidance technique was used to evaluate subacute effects on conditioned avoidance learning. Fish were conditioned to escape an electric shock by swimming to the opposite side of the test chamber. Fish were exposed to 20 ppm 2,4-D for 24 hr or 2 wk at various times during conditioning. Fish treated for 24 hr on the first day of conditioning exhibited significant differences in the magnitude of avoidance from that of controls. If treated on the ninth day of conditioning, no differences between experimental and control fish occurred. The pattern, rate of acquisition, and maintenance of avoidance baseline in fish exposed for 2 wk were different from controls. It is suggested that these tests are highly sensitive means of establishing a better estimate of the maximum acceptable toxicant concentration.

81-0163. Nimmo, D. R.; Hamaker, T. L.; Moore, J. C.; Wood, R. A. (Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **Acute and chronic effects of Dimilin on survival and reproduction of *Mysidopsis bahia.*** *ASTM STP 707:* pp. 366-376; 1980 (15 references).

Studies on the effects of the insecticide Dimilin (diflubenzuron) were conducted on mysid shrimp. Acute tests consisted of intermittently exposing shrimp to the pesticide, at concentrations ranging from 0.72 to 5.7 μg/l, and observing survival. Life cycle tests were conducted by exposing shrimp to continuous flow at concentrations of 0.075-0.91 μg/l. Reproductive effects tests were conducted by either 16 day exposures at 0.57 μg/l during various reproductive stages, or a 24-hr single dose (1.9 μg/l) at juvenile stage. The 96-hr LC50 was 2.06 μg/l; the 21 day LC50 was 1.24 μg/l. The 28-day exposure decreased the production of offspring. Chronic tests showed that parental and offspring reproductive success was affected. It is suggested that the contamination of estuaries with this compound could pose a hazard to crustaceans.

81-0164. Nizamani, S. M.; Hollingworth, R. M.* (Dep. Entomol., Purdue Univ., W. Lafayette, IN 47907) **Fentrifanil: a diarylamine acaricide with potent mitochondrial uncoupling activity.** *Biochem. Biophys. Res. Commun.* 96(2): 704-710; 1980 (15 references).

Studies on an acaricide with mitochondrial uncoupling activity [fentrifanil; 2′-chloro-2,4- dinitro-5′,6-di(trifluoromethyl)-diphenylamine] are presented. Isolated mitochondria (from mice livers) were incubated with fentrifanil, and oxygen uptake was measured polarographically using a Clark oxygen electrode. The ADP/O ratio, respiratory control index (RCI), and stimulation of state 4 respiration were also measured. Fentrifanil was found to stimulate oxygen consumption, reduce the RCI, lower the ADP/O ratio, and release the oligomycin block of ADP-stimulated respiration. In terms of the concentration required to decrease the RCI value by 50%, fentrifanil was about 4500-fold more potent than 2,4-dinitrophenol and slightly more potent than carbonylcyanide *m*-chlorophenylhydrazone (MCCP).

81-0165. Tofilon, P. J.; Clement, R. P.; Piper, W. N.* (Dep. Pharmacol., Coll. Med., Med. Cent., Univ.

Nebraska, Omaha, NE 68105) **Inhibition of the biosynthesis of rat testicular heme by 1,2-dibromo-3-chloropropane.** *Biochem. Pharmacol.* 29(19): 2563-2566; 1980 (24 references).

The nematocide 1,2-dibromo-3-chloropropane (DBCP) is known to produce oligospermia and azoospermia in workers engaged in its manufacture. DBCP was examined for its potential to interfere with regulation of the rat testicular heme biosynthetic pathway. Forty-eight hr after a single dose of DBCP (200 mg/kg, orally), testicular microsomal heme and cytochrome P-450 contents were depressed by approximately 27 and 35% respectively. Heme and cytochrome P-450 levels returned to control values at day 6. The incorporation of d-[4-^{14}C]aminolevulinic acid (ALA) into heme was depressed by approximately 43% at 24 hr. DBCP administration did not modify testicular heme oxygenase activity. These results indicate that DBCP inhibits testicular heme synthesis at an enzymatic reaction other than ALA synthetase. Mitochondrial ALA synthetase (EC 2.3.1.37) activity, unchanged 24 hr after DBCP administration, had increased by 66% at 48 hr and had returned to control values by day 6. The increased ALA synthetase activity probably reflects a compensatory attempt to restore the depressed heme content to control levels. (Author abstract by permission)

81-0166. Neudecker, T.; Lutz, D.; Eder, E.; Henschler, D. (Inst. Toxicol., Univ. Wuerzburg, D-8700 Wurzburg, BRD) **Structure-activity relationship in halogen and alkyl substituted allyl and allylic compounds: correlation of alkylating and mutagenic properties.** *Biochem. Pharmacol.* 29(19): 2611-2617; 1980 (15 references).

In a series of allylic chloro-olefins and their non-allylic isomers the significance of the allylic structure and the influence of methyl and chlorine substituents on the direct mutagenic activity in *Salmonella typhimurium* (TA 100) was tested. The direct mutagenic potentials correlate well with the alkylating activities as measured in the nitrobenzyl-pyridine (NBP) test. In contrast to allyl chloride, the vinylic chloro-olefins 2-chloro-1-propene and 1-chloro-1-propene did not show any direct mutagenic and alkylating properties. Monomethylated allylic chlorides are 6 to 30 times more mutagenic: 3-chloro-2-methyl- 1-propane < 3-chloro-1-butene < 1-chloro-2-butene. The non-allylic isomers 2-chloro-2-butene and 4-chloro-1-butene, however, are not directly mutagenic. In spite of a higher alkylating potency, bimethylated allylic chlorides did not show an increase in mutagenicity if compared with monomethylated derivatives: 3-chloro-2-methyl- 2-butane < 1-chloro-2-methyl- 2-butene. 1-Chloro-1-cyclohexane lacks mutagenic and alkylating activity, whereas 3-chloro-1-cyclohexane is comparable to allyl chloride in both respects. Dichloropropenes are also more directly mutagenic than allyl chloride: 2,3-dichloro-1-propene << *trans*- < *cis*-1,3-dichloropropene. Benzyl chloride exerted the highest alkylating activity of all substances tested in this survey, and is about 50 times more mutagenic than allyl chloride. Addition of rat liver S-9 mix was followed by a distinct decrease in the mutagenicity of directly mutagenic substances, the only exception being 2,3-dichloro-1-propene, which demonstrated as increase by a factor of 35. Under the same conditions, vinylic chloro-olefins are activated and become mutagenic to various degrees. Only 1-chloro-1-cyclohexane and the homoallylic compound 4-chloro-1-butene are negative both in the presence and absence of S-9 mix. (Author abstract by permission)

81-0167. Putinsev, A. I.; Gameza, N. A. (Dep. Hydrobiol., M. V. Lomonosov State Univ., Moscow, USSR) **Primenenie biokhimicheskikh pokazatelei u karpov pri eksperimental'noi intoksikatsii trimetilovokhloridom. [Use of biochemical indices in carp during experimental intoxication with tin trimethylchloride.]** *Biol. Nauk. (Moscow)* (8): 29-34; 1980 (36 references) (Russian).

To evaluate the toxicity of organostannous compounds, this-year-brood and 2-yr-old carp were exposed to tin trimethylchloride (TTMC; a molluscicide) at 0.01, 0.1, 0.5 and 1.0 mg/l for 45 days. An increase of serum alkaline phosphatase activity was recorded within the first 15 days of exposure, while activity of serum alanine aminotransferase and the level of cholesterol showed marked decrease within the first 7 days of exposure. These findings indicate that TTMC causes functional changes in the hepato-pancreatic system.

81-0168. Paulov, S.; Paulovova, J. (Dep. Gen. Zool. & Anim. Physiol., Fac. Sci., CS-88604 Bratislava, Czechoslovakia) **Poznamky k insekticidnej ucinnosti zivice. [Notes on the insecticide effectiveness of resin.]** *Biologia (Bratislava)* 35(8): 553-555; 1980 (6 references) (Slovak).

The insecticidal effectiveness of resins from *Pinus silvestris* and *Picea abies* on *Culex pipiens molestus*, and the toxicity to *Coturnix coturnix japonica* (quail) were studied. Low concentrations of the resins (0.01 g/100 ml water) had strong inhibiting effects on the development of the mosquitoes. The same concentration in drinking water, given to quails for 2 wk, had no harmful effects on the development of 3-day-old quails.

81-0169. Sullivan, R.; Quesenberry, P. J.; Parkman, R.; Zuckerman, K. S.; Levey, R. H.; Rappeport, J.; Ryan, M. (Hematol. Sect., Univ. Hosp., Sch. Med., Boston Univ., Boston, MA 02118) **Aplastic anemia: lack of inhibitory effect of bone marrow lymphocytes on *in vitro* granulopoiesis.** *Blood* 56(4): 625-632; 1980 (44 references).

Results are presented of experiments designed to determine the effects of bone marrow lymphocytes from 18 patients with myeloid aplasia on the proliferation of commuted granulocytic-monocytic progenitor cells (CFU-C).

Various causes of aplastic anemia have been identified, and in one of the patients studied insecticides were concluded to be the cause. Clinical profiles are given for all patients. The patient with insecticide etiology showed 2000 × 10^9 platelets/l, hematocrit of 30%, reticulocytes 0.4%, 3100 × 10^9 WBC/l, 700 × 10^9 PMN/l, and an estimated marrow cellularity of 10%. Marrow suspensions from patients were shown to contain significantly fewer viable CFU-C than similar cell preparations from controls. No effect on CFU-C growth was observed due to preincubation of marrow samples with rabbit anti-human lymphocyte serum and complement. In addition, no suppression of donor CFU-C proliferation was observed when marrow cells from patients were incubated with marrow from controls. None of the studies showed evidence for cell-mediated inhibition of CFU-C proliferation in the patients. It is concluded that in most aplastic anemia patients, the deficiency in hemopoietic stem cells within the marrow is not affected or sustained by suppressor lymphocytes.

81-0170. Baillie, M.; Allen, E. D.; Elkington, A. R. (Dep. Child Health, Southampton Gen. Hosp., Southampton SO9 4XW, England) **The congenital warfarin syndrome: a case report.** *Br. J. Ophthalmol.* 64(8): 633-635; 1980 (13 references).

A case is reported of a baby born with congenital abnormalities due to maternal ingestion of warfarin during pregnancy. A 24-yr-old woman who developed a pulmonary embolus while taking oral contraceptives was prescribed warfarin several years before her pregnancy, and continued to take it through the 35th wk of gestation. The baby had a hypoplastic nose due to failure of development of the nasal septum, and radiographs of pelvis and femora showed stippling in the greater trochanter and left pubis and also abnormal vertebral bodies in S4/5. The lacrimal sac was distended, presumably due to obstruction of the nasolacrimal duct associated with malformation of the nose. It is suggested that heparin rather than warfarin be prescribed for anticoagulant therapy during pregnancy. Since a variety of ocular abnormalities have been reported in babies, exposed prenatally to warfarin, ophthalmologists should seek a history of maternal ingestion when seeing a baby with congenital ocular abnormalities.

81-0171. Szczepaniak, S.; Sienkiewitcz, E. (Dep. Chem. Toxicol., Inst. Pharm. Anal. & Technol., Acad. Med., PL-20080 Lublin, Poland) **Wydalanie aminokwasow z moczem szczurow w ostrym zatruciu chlorfenwinfosem. [Aminoacid elimination in rat urine following acute intoxication with chlorfenvinphos.]** *Bromatol. Chem. Toksykol.* 13(1): 31-36; 1980 (16 references) (Polish).

The acute toxicity obtained from oral applications of 0.5 LD50 doses of chlorfenvinfos to rats was studied. The 24 hr elimination of amino acids and amine nitrogen was determined. The hypothesis that decreased amino acid levels in the blood stream, due to excessive excretion by the kidney and decreased reverse absorption by the canals, causes increased amino acid levels in urine was tested. Separation and determination of amino acids was achieved by paper chromatography and spectro-colorimetry. Amine nitrogen was determined by the ninhydrin method. The test results showed that the concentrations of amino acids and amine nitrogen in the 24 hr urine elimination do not differ from controls. However, the quantity of the eliminated amino acids in the first few days after poisoning was considerably smaller due to the noticeable oliguria in this period of time.

81-0172. Teichert-Kuliszewska, K.; Szymezyk, T. (Dep. Biochem., Inst. Biopharm., Acad. Med., PL-02097 Warsaw, Poland) **Badania toksycznosci dichlorfosu i jego metabolitow na poziomie molekularnym w swietle pismiennictwa lat ostatnich. [Studies on molecular level toxicity of dichlorvos and its metabolites as indicated in current literature.]** *Bromatol. Chem. Toksykol.* 13(1): 37-40; 1980 (46 references) (Polish).

The effects of dichlorvos (DDVP) and its metabolites on living processes, particularly the influence on basic enzymatic systems, were reviewed. The mechanism of dichlorvos poisoning is mainly due to the inhibition of activities of the acetylcholine hydrolase. Considerable increased quantities of acetylcholine were found after dichlorvos poisoning in parts of the brain, generally in the hemisphere and particularly in the corpus striatum. Therefore, the corpus striatum is considered to be a key area for neurotoxicity by dichlorvos. Dichlorvos can cause changes in the activities of the enzymatic proteins and it effects the metabolism of carbohydrates. Acute toxicity with phosphoroganic compounds is accompanied with an increase of glucose concentration in blood, and changes of the activities of catabolism and anabolism enzymes of glycogen in the liver. Dichlorvos toxicity causes the stimulation of the glycogenolysis process and the inhibition of glycogenesis. Results of studies on glucose levels in blood of offspring from females receiving dichlorvos during pregnancy are controversial. Dichlorvos toxicity is a summation of the direct influence of pesticides and their metabolites on the activities of protein enzymatic cells and the neuro-hormonal system. Mutagenic effects of dichlorvos treatment were also observed. At large doses dichlorvos is also teratogenic.

81-0173. Michalska, M.; Plewinski, J.; Wierzbicki, R. (Dep. Biochem., Inst. Environ. Anal. & Bioanal., Acad. Med., PL-90145 Lodz, Poland) **Badania trombоelastograficzne osocza szczurow narazonych no octan fenylorteciowy. [Thromboelastographic study of plasma from rats exposed to phenylmercuric acetate.]** *Bromatol. Chem. Toksykol.* 13(1): 55-59; 1980 (14 references) (Polish).

The course of coagulation due to poisoning with heavy metals is not sufficiently known. Thromboelastography permits general evaluation of the course of coagulation and the dynamics of forming the thrombus, and is particularly useful in the study of coagulation caused by the action of foreign material. The *in vivo* and *in vitro* effects of mercury on rat plasma coagulation was determined by ig administration of a single dose equal of the 0.5 LD50 of phenylmercuric acetate (PMA) in water or 2 doses of 0.05 LD50 PMA/wk. Thromboelastrographs of plasma from rats suffering acute PMA toxicity clearly indicate hypercoagulation; considerably decreased time constants, r and S; increased dynamics of thrombus formation; and decreased time of obtaining cohesion and elasticity. Similar effects were observed by *in vitro* experiments with low concentrations of mercury. Hypercoagulation with a low concentration of mercury is of particular interest because of existing professional and environmental exposures of humans to mercury and its compounds. Mercury can also directly affect the process of fibrinogen conversion and structure of thrombus.

81-0174. Klukowska-Siczek, L. (Dep. Hum. Physiol., Inst. Clin. Pathol., Acad. Med., PL-20080 Lublin, Poland) **Wplyw chlorfenwinfosu na niektore wskazniki hematol ogiczna krwi u szczurow. [Effect of chlorfenvinphos on hematological indicators in rat blood.]** *Bromatol. Chem. Toksykol.* 13(2): 145-149; 1980 (31 references) (Polish).

The effect of chlorfenvinphos on the blood components of ra ts, given doses of 0.5 LD50 ig, was tested. Acute toxicity by chlorfenvinphos caused a statistically insignificant decrease of the hematocrit index (4%); hemoglobin level (3%); and red corpuscle count (1%). However, the leukocyte count decreased by 14%, the level of monocytes increased by 9%, and the level of the portion of heterophiles with segmental nuclei increased by 21%. The level of other leukocytes was normal. Changes in the leukograph indicated considerably decreased number of lymphocytes, and a considerable increase in the quantities of granulocytes with segmental nuclei.

81-0175. Bogacka, T.; Groba, J. (Dep. Prot. Estuarine Waters, Inst. Meterol. & Water Manage., PL-80252 Gdansk, Poland) **Toksycznosc i biodegradacja chlorfenwinfosu, karbarylu oraz propoksuru w srodowisku woknym. [Toxicity and biodegradation of chlorfenvinphos, carbaryl and propoxur in water environment.]** *Bromatol. Chem. Toksykol.* 13(2): 151-158; 1980 (32 references) (Polish).

The toxicity and biodegradation of chlorfenvinphos, carbaryl and propoxur in a water environment were studied. The toxicity of these pesticides were determined on *Lemna minor, Scenedesmus quadricanda, Lebistes reticulatus* and *Daphnia magna.* Carbaryl and propoxur were the least toxic to plant and animal organisms. Chlorfenvinphos was the most toxic for animal organisms and *Lemna minor. Daphnia magna* was the most sensitive, overall, to pesticide action. A decrease in toxicity with time and a lack of reaction stability were noted in experiments with fish. Reproduction, biomass, and chlorophyll content, as well as inhibition of photosynthesis intensity, were affected by pesticides in plants. Due to the lack of accumulation of these pesticides in the organisms, the following concentrations are proposed as maximum allowable concentrations in surface waters: carbaryl 0.01 $\mu g/dm^3$; propoxur 0.12 $\mu g/dm^3$; and chlorfenvinphos 0.01 $\mu g/dm^3$. Biodegradation of the above pesticides was studied in modeled river water and aqueous ecosystem conditions. The rate of pesticide degradation depends on the initial concentration, the temperature, and the model used in the experiments. Pesticide degradation in water proceeded in the order carbaryl > propoxur > chlorfenvinphos. A temperature decrease inhibited pesticide degradation. Accumulation of the pesticides in water organisms (algae, snails and fish) or in bottom sediments was not observed. Under experimental conditions the basic metabolites (1-naphthol and 2-isopropoxyphenol) were occasionally found in very small quantities (0.1 - 6 $\mu g/dm^3$).

81-0176. Szczepaniak, S.; Jeleniewicz, K. (Inst. Chem. Toxicol., Inst. Anal. & Pharm., Acad. Med., Lublin, Poland) **Zmiany stezen wolnych aminokwasow w erytrocytach drwi szczura w ostrym zatruciu karbarylem. [Alterations of free amino acid concentration in rat blood erythrocytes following acute intoxication with carbaryl.]** *Bromatol. Chem. Toksykol.* 13(2): 159-165; 1980 (18 references) (Polish).

Male Wistar rats were used to determine the effects of the insecticide carbaryl on erythrocytes. A single oral dose of 474 mg/kg was administered. Erythrocytes were sampled at 2, 4, 24, 72 and 120 hr. Free amino acid concentration was determined by paper chromatography and spectrophotometry. Amino nitrogen level was determined by the ninhydrin method. Most of the amino acids decreased at 2-24 hr after treatment. After 2 hr the amino acids showed decreases of 69.4% (methionine), 63.4% (asparaginic acid with serine and glycine), 63.4% (leucine with isoleucine), 56.9% (alanine), 56.5% (valine with phenylalanine), 54.4% (glutamic acid with threonine), and 36.7% (tyrosine with tryptophan). The concentration of lysine with histidine and arginine increased, while no effect was seen on cystine with cysteine.

81-0177. Tyburczyk, W.; Borkowska, J.; Choragiewicz, H.; Klimek, K.; Sieniawska, T. (Inst. Fundam. Res., Inst. Med. Pract. & Hyg., Lublin, Poland) **Wplyw fosfamidonu na przemiane amin katechloewych i serotoniny w mozgu szczura. [Effect of phosphamidon on catecholamines and serotoninamines transformation in rat brain.]** *Bromatol. Chem. Toksykol.* 13(2): 165-169; 1980 (15 references).

The effects of phosphamidon on the transformation of catecholamines and seratoninamines in rat brain were studied. Phosphamidon was administered by stomach tube in a single dose of 0.1 LD50 or in daily doses of 0.05 LD50 for 30 days. The single dose decreased the blood free tryptophan, serotonin and brain noradrenalin, and increased brain 3,4-dihydroxyphenylacetic acid after 24 hr. The repeated doses increased brain serotonin, 5-hyroxyindoleacetic acid, 5-hydroxytryptophan, tryptophan, and 3,4-dihydroxyphenylacetic acid levels, and decreased brain noradrenalin.

81-0178. Tyburczyk, W.; Borowska, J.; Choragiewicz, H. (Inst. Fundam. Res., Inst. Med. Pract. & Hyg., Lublin, Poland) **Wplyw fosfamidonu na dekarboksylacje kwasu glutaminowego w mozgu szczura. [Effect of phosphamidon on glutamic acid decarboxylation in rat brain.]** *Bromatol. Chem. Toksykol.* 13(2): 171-174; 1980 (10 references) (Polish).

Wistar rats were used to test the effects of phosphamidon on brain glutamic acid decarboxylase activity, and brain glutamic acid and γ aminobutyric acid levels. Rats were treated with a single dose of 0.1 LD50 or daily doses of 0.05 LD50 administered by stomach tube for 30 days. The single dose decreased the whole blood cholinesterase activity, but did not affect brain glutamic acid decarboxylation. Repeated doses decreased glutamic acid and increased γ aminobutyric and glutamic acid decarboxylase activity. Brain acetylcholinesterase activity decreased with both acute and subacute intoxication.

81-0179. Rolecki, R. (Dep. Toxic. Eval., Inst. Med. Pract., PL-91348 Lodz, Poland) **Enzymy surowicy krwi w doswiadczalnych badaniach hepatotoksycznego dzialania substancji chemicznych. [Serum enzymes in experimental studies of hepatotoxic effects of chemicals.]** *Bromatol. Chem. Toksykol.* 13(2): 207-210; 1980 (53 references) (Polish).

The determination of enzyme activities in blood serum after the application of chemical compounds is used to evaluate their hepatotoxicity. Changes in enzymatic activities of blood serum due to the effects of various chemical compounds depend on the type and characteristics of the enzyme, its subcellular location, and the type and dosage of the active hepatotoxic compound. This paper is a review of studies on hepatotoxic effects of various chemicals, such as carbon tetrachloride, thioacetamide, mercuric chloride, and diethanolamine. Increased activity of aminotransferase was observed in rats dosed with the above chemicals, with the dependance of increased activity to dosage in a certain range. The increased activity of aminotransferase in serum caused by toxic substances depended on the degree of structural damage in hepatocytes. With smaller levels of chemicals, increased SDH activities in serum were observed. This is used to discover minor damage to the liver. Increased activities of the cytoplasmic enzymes (ICDH, MDH, LDH, IPAld and glutation-S-transferase) in blood serum are observed after the application of chemicals, which cause large increase in the activities of SDH and aminotransferase. Increases in of lysosomal enzymes (AcP, RNA) activities indicate hepatotoxic effects of the applied chemicals.

81-0180. Ramade, F.; Valens, M.; Roffi, J. (Lab. Endocrinol. & Zool., Univ. Paris Sud, F-91405 Orsay, France) **Effets de l'intoxication aigue ou chronique par le lindane ou l'acide trichloro 2,4,5-phenoxyacetique sur les catecholamines surrenaliennes et urinaires de Rat. Influence d'un regime hypo- et hyperlipidique. [Effects of acute or chronic intoxication by lindane or 2,4,5-T on adrenal and urinary catecholamines in rats. Effects of hypo- and hyperlipid diet.]** *C. R. Soc. Biol.* 174(3): 274-279; 1980 (11 references) (French).

The effects of acute (15 mg lindane, 25 mg 2,4,5-T ip) and chronic (60 and 100 ppm in feed) intoxication on adrenal catecholamines of rats were studied. The doses of lindane and 2,4,5-T administered caused no significant mortality. In 1 hr after injection of the 2 substances drops occurred in the level of adrenal epinephrine by 85% and 45% respectively, and a concurrent increase in the urinary excretion of the hormone took place. Without pesticides a hyperlipid diet increased adrenal epinephrine level by 58%. However, long-term oral intoxication with either of these pesticides inhibited this increase; this observation was not made with a normal diet. Ingestion of lindane by rats prevents the development of obesity following the feeding of a high-fat diet. This inhibiting effect is attributed to a rise in hormone secretion.

81-0181. Rodd, F. H.; Plowright, R. C.; Owen, R. E. (Dep. Zool. Univ. Toronto, Toronto, Ontario M5S 1A1, Canada) **Mortality rates of adult bumble bee workers (Hymenoptera: Apidae).** *Can. J. Zool.* 58(9): 1718-1721; 1980 (13 references).

Survivorship data were obtained for a cohort of 274 individually marked workers of the bumble bee *Bombus terricola* Kirby. The mortality rate was very nearly constant for the first 14 days of adult life, after which it increased sharply. Environmental hazards, including predation, are considered the most probable causes of death, supplemented by the effects of wear and tear as the insects grow old. In parallel studies of *Bombus* mortality associated with spruce budworm control operations in New Brunswick, adult survival was consistently found to be higher in areas treated with the insecticide aminocarb (Matacil) than in comparable untreated control locations. Since aminocarb is thought to be toxic to spiders, and crab spiders are predators of worker bumble bees, it is speculated that this higher survival may have been brought about by reduction of predation pressure. The life expec-

tancy for a newly emerged adult worker bee was estimated at 13.2 days. The results, together with those of other studies, are discussed with reference to differences in mortality rates between temperate and tropical bumble bee species. (Author abstract by permission, modified)

81-0182. Jelinkova, N.; Mahelova, E.; Rattayova, E. (State Inst. Prev. Med., Bratislava, Czechoslovakia) **Chlorovane fenoly ako degradacne produkty pesticidov. [Chlorinated phenols as degradation products of pesticides.]** *Cesk. Hyg.* 25(6-7): 294-300; 1980 (22 references) (Slovak).

The toxic effects of degradation products of HCB (hexachlorobenzene), BHC, 2,4-D, MCPA and 2,4,5-T, including 2,4-dichloro-, 2,4,5-trichloro-, 2,3,4,6-tetrachloro-, and pentachlorophenols present in foods as residues were evaluated. The decomposition steps leading to phenols are identified, and the physiological and pathological effects on rats, mice and humans are described. While 2,4-dichlorophenol is nontoxic for humans, 2,4,5-trichlorophenol is mildly toxic, with the degree of toxicity depending on lipophilicity and pH of the environment (skin). The chlorinated phenol compounds are neither teratogenic nor carcinogenic. Tetrachlorophenols cause dermatitis in humans, but when they were fed at 30 mg/kg body wt to rats neither weight gains nor embryonic development were affected. Pentachlorophenol is toxic to animals. In humans it causes skin irritation, fever, loss of body liquids, and liver and kidney failure; the most acutely toxic route is intake by inhalation. The maximum permissible dose is 3 μg/kg/day.

81-0183. Crombach, C. (Author address not given) **Norm voor organofosfor-insekticiden in oppervalaktewater to hoog. [Maximum allowable organophosphorus insecticide residue level in surface waters is too high.]** *Chem. Mag.* (9): M471; 1980 (Dutch).

The effects of parathion and azinphos-methyl on zooplankton were studied in an open-air fresh-water ecosystem. Compared with untreated controls, the toxic effects of the pesticides on the zooplankton were significant at a concentration of 1 μg/l, but differences were also seen at 0.5 μg/l. No effect was seen at 0.2 μg/l. It is suggested that the maximum allowable level should be reduced from 1 μg/l (paraoxon equivalent) to 0.1 μg/l.

81-0184. Matsuo, M. (Res. Dep., Pestic. Div., Sumitomo Chemical Co. Ltd., Takarazuke, Hyogo 665, Japan) **The i/o*-characters to correlate bio-accumulation of some chlorobenzenes in guppies with their chemical structures.** *Chemosphere* 9(7-8): 409-413; 1980 (6 references).

A discussion is presented in which the inorganic/organic (i/o) characters correlated to bioaccumulation of chlorobenzenes in fish with their chemical structures. Among the compounds considered is hexachlorobenzene. The two parameters, [i]:[o] and [i]:[o], are developed. Bioaccumulation data of 6 compounds in guppies were taken from the literature and used to develop the new parameters in order to normalize Σi, Σo and to emphasize relative characters of i and o of the molecule. These new parameters are shown to be as good as Σi, Σo and Σi/Σo to correlate bioaccumulation of some chlorobenzenes with their chemical structure.

81-0185. Moeschlin, S. (Med. Sch., Univ. Basel, Basel, Switzerland) **Thallium poisoning.** *Clin. Toxicol.* 17(1): 133-146; 1980 (27 references).

Aspects of thallium toxicity are reviewed. The rodenticide thallium sulfate is still used in some parts of the world, including the southern United States. Thallium is essentially an enzyme poison, and its lethal dose varies considerably from case to case. Although some fatalities have been observed at doses of 8 mg/kg, the usual lethal dose in adults is higher (10-15 mg/kg). Absorption, excretion, and blood and urine levels are discussed. Symptoms of thallium toxicity are described, and it is noted that early symptoms are often uncharacteristic and include vomiting, pain in legs and abdomen, excessive thirst, sleeplessness, and restlessness. Later symptoms are tachycardia, a moderate increase in blood pressure, severe toxic polyneuritis, and often complete areflexia of the lower extremities. Several case histories are described, and pathological findings are discussed. Methods for diagnosis and treatment are presented.

81-0186. Reuber, M. D. (Frederick Cancer Res. Cent., Frederick, MD 21701) **Significance of acute and chronic renal disease in Osborne-Mendel rats ingesting dieldrin or aldrin.** *Clin. Toxicol.* 17(2): 159-170; 1980 (6 references).

Renal lesions developed in Osborne-Mendel male and female rats ingesting dieldrin or aldrin in the diet. Chronic interstitial nephritis was seen in rats surviving for 52 wk or longer. The incidence of nephritis was highest and the lesion was most severe in male rats given the higher dose levels of dieldrin, 50 ppm or higher. Over one-half of the rats fed dieldrin or aldrin at 150 ppm, and many fed 100 ppm, died from renal necrosis and sometimes hepatic necrosis during the first year. More female rats died from renal necrosis than did male rats. Rats dying from renal necrosis did not develop tumors; those from severe chronic nephritis either did not have tumors or had preneoplastic lesions that would have become tumors if the animal had lived longer. Thus acute and chronic effects should both be examined carefully when evaluating the safety of a chemical. In addition to causing the death of the animal, acute and chronic toxic effects can prevent the development of malignant tumors by shortening the animal's life

span or by causing illness and inhibiting the development of a tumor that otherwise might occur in a healthy animal. (Author abstract by permission)

81-0187. Boyd, M. R. (Mol. Toxicol. Sect., Clin. Oncol. Prog., Div. Cancer Treat., NCI, Bethesda, MD) **Biochemical mechanisms in chemical-induced lung injury: roles of metabolic activation.** *CRC Crit. Rev. Toxicol.* 7(2): 103-176; 1980 (272 references).

An extensive review of the *in vivo* biotransformations of relatively inert chemicals to highly reactive metabolites (metabolic activation) is presented. Specifically, studies are included that concentrate on the lung as a target organ for toxicities due to metabolic activation. Of particular interest are studies on thiourea, paraquat, and the similarities of some superoxides to paraquat. The most widely studied thiourea is the rat poison α-naphthylthiourea (ANTU). This compound induces a fibrin-rich pulmonary edema and massive pleural effusions resulting from an increase in capillary and venular permeability. A 5 mg/kg dose was lethal to rats. Pulmonary edema and effusions were observed, as well as damage to epithelial cells, specifically pneumocytes. Several possible metabolic activation reactions are presented. The broad spectrum herbicide paraquat is characterized by lethal pulmonary toxicity in man and other animals after ingestion. Ten to 60 mg/kg paraquat in rats induces enlarged, edematous and plum-colored lungs in 12-36 hr after ingestion. Both type I and type II pneumocytes are severely damaged, but pulmonary capillary endothelial cells are undamaged. Several investigators have observed accumulation of this compound in the lungs after ingestion. A series of possible metabolic activation reactions are presented. The metabolites of nitrofurantoin has several features that are similar to paraquat. Superoxides are generated in large amounts in incubation mixtures containing rat lung microsomes. The production of hydrogen peroxide in rat lung microsomes in the presence of oxygen is also stimulated. It is concluded that the mechanisms of toxicity of both these compounds is the generation of toxic activated oxygen species.

81-0188. Rajendra, W.; Chetty, C. S. R.; Anasuya, R.; Indira, K.; Swami, K. S. (Dep. Zool., S. V. Univ., Tirupati 517502, India) **Insecticide impact on contractile pattern of amphibian skeletal muscle.** *Curr. Sci.* 49(13): 502-504; 1980 (12 references).

Twitch properties were observed for gastrocnemius muscles of medium sized frogs, *Rama hexadactyla*, exposed to direct and indirect stimulation with DDT. Significant decreases were observed in the shortening length, twitch duration, half contraction time, and half relaxation time during both indirect and direct stimulation. The half contraction and half relaxation times were decreased to a greater extent by indirect than by direct stimulation with DDT. This suggests a possible greater involvement of DDT with the contraction pattern via the neuro-muscular junction than via individual cellular response systems.

81-0189. Al-Najjar, N. R.; Soliman, A. S. (Dep. Biol., Coll. Sci., Univ. Baghdad, Baghdad, Iraq) **Cytological effects of fungicides. I. Mitotic effects of Vitavax-200 and Dithane S-60 on wheat and two related species.** *Cytologia* 45(1-2): 163-168; 1980 (9 references).

Studies were performed in which the effects of the fungicides Vitavax-200 (carboxin) and Dithane S-60 (mancozeb) on mitosis of wheat and related species were investigated. Seeds were treated with 2 g/kg seed. Treated and untreated seeds were germinated in the laboratory. Root-tip squash preparations were used to assess the mitotic index and the estimated duration of each stage. Both fungicides caused reductions in the mitotic index of each species. Vitavax reduced the index of *Triticum durum* to a greater extent than the other species and Dithane reduced the index of *T. aestivum* and *Aegilops ligustica* more than it reduced the index of *T. durum*. The duration of metaphase was increased the most by the fungicides. Both fungicides caused a high percentage of chromosomal aberrations, mainly chromosomal bridges, during anaphase.

81-0190. Soliman, A. S.; Al-Najjar, N. R. (Dep. Biol., Coll. Sci., Univ., Baghdad, Baghdad, Iraq) **Cytological effects of fungicides. II. Cytological aberrations induced by Vitavax-200 and Dithane *S*-60 in meiotic cells of wheat and two related species.** *Cytologia* 45(1-2): 169-175; 1980 (14 references).

Studies were performed on the effects of two fungicides on the chromosomes of wheat and wheat-like grains. Seeds were treated with either Vitavax-200 (carboxin) or Dithane S-60 (mancozeb) at 2 mg/kg seed. Treated and untreated seeds were planted in 3 randomized blocks. At heading, young spikes were fixed and prepared for histological examination. The percentage of abnormal cells in Vitavax-treated plants was higher than in controls. *Triticum aestivum* had up to 42.65% abnormal cells in anaphase II. *T. durum* had up to 33.77% abnormal cells in anaphase I. *Aegilops ligustics*, the least sensitive, had 21.45% abnormal cells present in metaphase I. Dithane treatments caused similar abnormalities. The types of chromosomal aberrations observed were lagging chromosomes, single and multiple bridges, asynchronization, and rings of chromosomes. These two fungicides were concluded to definitely be mutagenic to the species studied and to have actions similar to other chemical mutagens.

81-0191. Amer, S. M.; Farah, O. R. (Lab. Genet. & Cytol., Natl. Res. Cent., Cairo, Egypt) **Cytological effects**

of pesticides. X. Meiotic effects of Phosvel. *Cytologia* 45(1-2): 241-245; 1980 (12 references).

The effects of the insecticide Phosvel (leptophos) on meiosis in *Vicia faba* were investigated. Plants were sprayed with the insecticide at 2.25 *l* (30% AI) in 200 *l* water and at 2.25 *l* (30% AI) in 500 *l* water. Plants were sprayed at 15 days (seedling stage) and at 35 days (flowering stage). The percentage of abnormal pollen mother cells (PMCs)/plant increased by as much as 23.2% for the first treatment and 26.35% for the second treatment. Chromosome abnormalities included disturbed metaphase II and anaphase II, chromosome stickiness, lagging chromosomes, fragmentation and anaphase bridges.

81-0192. Grobe, V. J. W. (Facharzt Dermatol. Venerol. & Allergol., D-5500 Trier, BRD) **Gutachterliche beobachtungen bei arsenintoxikationsspatfolgeschaden mit porphyria cutanea tarda und Dupuytren'scher kontraktur. [Observations on arsenic intoxication with late sequence damage in porphyria cutanea tarda and Dupuytren's contracture.]** *Dermatosen Beruf Umwelt* 28(4): 116-117; 1980 (9 references) (German).

Cases are discussed of 2 vineyard workers occupationally exposed to arsenic sprays. The first patient was exposed to arsenic sprays for 30 days/yr from 1920-42, and the second for 40 days/yr from 1939-42. Neither patient recalled immediate symptoms of poisoning after spraying. The first symptoms observed, after 34 yr in the first patient and 35 yr in the second patient, were melanoses, keratoses and precanceroses. A porphyria cutanea tarda also appeared, and a Dupuytrin's contracture developed on the hands of both patients. A connection between porphyria and arsenic injury is suggested.

81-0193. Wild, B. L. (Univ. California, Riverside, CA) **Resistance of citrus green mold *Penicillium digitatum* Sacc. to benzimidazole fungicides.** *Diss. Abstr. Int. B* 41(4): 1184-1185; 1980.

This dissertation is a study of the ecology and epidemiology of *Penicillium digitatum* strains resistant to the benzimadazole fungicides, benomyl, carbendazim, thiabendazole and thiophanate methyl. Variant strains of *P. digitatum* were classified into 5 categories according to their resistance to carbendazim and thiabendazole, as measured by fungus growth and sporulation in the presence of these inhibitors *in vitro*. The capability of *P. digitatum* strains of each category to infect fruit treated with high concentrations of benomyl and thiabendazole was determined. Every isolate of *P. digitatum* tested that was resistant to one of these fungicides was resistant also to the other (cross-resistant) . Carbendazim-resistant isolates representative of categories I, II and III were as pathogenic as the sensitive strain (category O) when single strains were inoculated alone into organs. However, when the inoculum was a mixture of sensitive (wild) strains and resistant (variant) strains, the latter decreased in frequency in subsequent spore generations. Despite the suppression of the resistant strains by the sensitive strains in citrus fruit in the laboratory, it was demonstrated that a high level of resistant strains could be maintained in the spore population of a citrus packinghouse through the mechanism of double-resistance to the benzimidazole fungicides and either sodium *o*-phenylphenate (SOPP) or *sec*-butylamine (SBA). Competition experiments in untreated oranges showed that the frequency of the doubly-resistant isolates decreased when co-inoculated with a sensitive strain. No isolates were found that were triply-resistant to the benzimidazole fungicides SOPP and SBA, or doubly resistant to SOPP and SBA. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8020624)

81-0194. Lukan'ova, A. M.; Voytenko, G. O. (All-Union Sci. Res. Inst. Hyg. & Toxicol. Pestic. Polym. Plast. Mater., USSR Min. Public Health, Kiev, USSR) **Pokazniki elektrichnoi aktivnosti sertsya yak kriteriy viznachennya porogovikh kontsentratsiy pestitsidiv. [Parameters of the electrical activity of the heart as a criterion for determining the threshold concentrations of pesticides.]** *Dopov. Akad. Nauk. Ukr. RSR Ser. B* (8): 73-76; 1980 (5 references) (Ukrainian).

The effect of 1-mo inhalation of Maloran (chlorbromuron), anilate and Afugan (pyrazophos) on ECG changes was studied in male albino rats. The threshold concentrations, determined by specific tests (cholinesterase activity for Afugan, hematological and other tests for Maloran and anilate), were 3.6 mg/m^3 for anilate, 5.4 mg/m^3 for Maloran, and 0.4 mg/m^3 for Afugan. Inhalation of the pesticides in the respective threshold concentrations, and sometimes even in subthreshold concentrations, caused ECG changes (disturbance of depolarization processes). The findings indicate that the study of ECG changes may be more sensitive or just as sensitive as some specific and integral tests.

81-0195. Morello, A.; Repetto, Y.; Agosin, M. (Dep. Zool., Riverbend Res. Lab., Univ. Georgia, Athens, GA 30602) **Methoprene and hydroprene are metabolized by ester cleavage in isolated hepatocytes.** *Drug Metab. Dispos.* 8(5): 309-312; 1980 (13 references).

The mechanism of methoprene and hydroprene metabolism by isolated hepatocytes was investigated. Rat liver hepatocytes were incubated with (^{14}C) labeled pesticide. At timed intervals, samples were removed and analyzed. Both pesticides were metabolized to their corresponding acids. Small amounts of glucuronide conjugates were found. It was determined that the esterase activity is of microsomal origin. The NADPH-dependent cytochrome P-450 system is involved in the metabolism of either compound.

81-0196. Mancall, E. L. (Dep. Neurol., Hahnemann Med. Coll., Philadelphia, PA) **Managing peripheral nerve damage due to systemic causes.** *Drug Ther.* 10(10): 123-127, 130-131, 134; 1980.

Some of the causes and treatments for peripheral nerve damage are reviewed. It is pointed out that polyneuropathies are commonly due to systemic causes, usually of a toxic or metabolic nature. Symptoms include distal weakness, reflex loss, muscular atrophy, and a symmetrical reduction in deep and superficial sensibilities. While the diagnosis is generally not difficult, determining the underlying cause can be. Among the causes discussed are alcoholism, diabetes, malignant lesions, drug side effects, various infections and hereditary diseases, heavy metals and organic solvents. Specific symptoms and treatment are discussed for each cause. Arsenic, thallium, mercury and DDT are all known to cause polyneuropathy.

81-0197. Reuber, M. D. (Chem. Carcinog. Program, Frederick Cancer Res. Cent., Frederick, MD 21701) **Carcinogenicity of pronamide.** *Environ. Res.* 23(1): 1-12; 1980 (8 references).

There has been one mouse and one rat study on the carcinogenicity and one dog study on the toxicity of the pesticide pronamide. Pronamide was carcinogenic for the liver of male mice. In addition, male mice developed severe diffuse hyperplasia and cholestasis of the liver, the latter an extremely rare lesion in the rodent liver. The pronamide rat and dog studies were unsatisfactory carcinogenicity studies. (Author abstract by permission)

81-0198. Shtenberg, A. I. (Inst. Nutr., Moscow, USSR) **Rezul'taty nauchnykh issledovanii po gigiene pitaniya i pishchevoi toksikologii (1977-1978). [Results of research on hygiene of nutrition and food toxicology (1977-1978).]** *Gig. Sanit.* 45(9): 49-52; 1980 (Russian).

Current data on the toxicity of new pesticides are reviewed. It was shown that the systemic fungicides Kalinix (a heterocyclic compound) and Afugan (pyrazophos; an organophosphate) show embryotoxic and teratogenic activity at low levels of exposure (0.005-0.1 LD50). The safe daily dose of Afugan was estimated to be 0.2 mg. The threshold of carcinogenic activity of the pesticide Isophos-3 was 1/600 LD50. Combined administration of Isophos-3, DDT, and γ-HCCH (lindane) with sarcoma Moloney virus enhanced the oncogenesis. Pre-emergence application of herbicides Dicuran (chlortoluron) and simazine (2 and 3 kg/ha, respectively) had no negative effect on the organoleptic properties and nutritional value of winter wheat.

81-0199. Kuz'menko, N. M.; Didenko, G. G.; Kurinnyi, A. I.; Martson', L. V.; Petrovskaia, O. G.; Pilinskaia, M. A.; Shepel'skaia, N. R. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Otdalennye posledstviia pri deistvii pestitsidov. [Long-term effects of pesticides.]** *Gig. Sanit.* 45(9): 88-89; 1980 (30 references) (Russian).

Cytogenetic methods were employed for comparative evaluation of the mutagenic activity of 23 pesticides. Increased frequency of chromosome aberrations in bone marrow cells was recorded after administration to mice of high doses of tetramethylthiuramdisulfide (TMTD; thiram), ziram, Yalan (molinate), chlorophos (trichlorfon), phthalophos (phosmet), metaphos (methyl parathion), Valexon (phoxim), phosphamide (dimethoate) and 2,4-D. A number of derivatives of carbamic, thio-, and dithiocarbamic acids, urea derivatives, and hydrazine derivatives showed carcinogenic activity. Dithiocarbamate pesticides were found to pass across the placenta and cause embryotoxic and gonadotoxic effects. Teratogenic activity was recorded for derivatives of chlorophenoxyacetic acid.

81-0200. Geissler, W. G.; Lingens, F. (Inst. Mikrobiol., Univ. Hohenheim, D-7000 Stuttgart 70, BRD) **Involvement of bacterial membranes in the organization of herbicide-degrading enzymes.** *Hoppe-Seyler's Z. Physiol. Chem.* 361(9): 1284-1285; 1980 (1 reference).

Investigations on the localization of chloridazon-dioxygenase (cd) complex, dihydrodiol dehydrogenase (dd) and chloridazoncatechol deoxygenase (ccd) in the membranes of pyramin (chloridazon)-degrading bacteria are discussed. Osmotic pressure on intact cells, extraction of periplasm and formation of spheroplasts resulted in loss of dioxygenase activity, but the activity of the other enzymes was not affected. The loss of activity is regained by releasing the cells from osmotic pressure. A NADH-dependent dichloroindophenol reductase was determined to be present in the periplasm. It is concluded that the outer membrane and the periplasm are involved in the organization of the cd complex. The dd complex was determined to be partially bound to the inner membrane. Ccd was found to be a soluble cytoplasmic enzyme.

81-0201. Goldfrank, L.; Bresnitz, E. (Bellevue Hosp., New York, NY) **Camphor.** *Hosp. Physician* 6(9): 45-48, 53, 54, 67; 1980 (17 references).

A case of camphor poisoning is presented. A woman was admitted to an emergency room in a confused state. All signs were normal except the ECG, which showed sinus tachycardia with evidence of left ventricular hypertrophy. The oropharynx was clear, but an odor like that of mothballs was noted. It was determined that the patient had ingested camphorated oil instead of castor oil. Accidental poisonings, treatment for camphor poisoning, steps in the diagnosis of poisons, and steps to be taken when the poison is not identified are discussed.

81-0202. Anonymous **Arsenic and arsenic compounds.** *IARC Monogr.* 23: 39-141; 1980 (219 references).

This monograph on arsenic and arsenic compounds includes information related to the chemical and physical data of the chemicals studied; production, use, occurrence and analysis of compounds; biological data relevant to the evaluation of carcinogenic risk from these compounds in humans; and a summary and conclusions based on the available data. Specific compounds used in agricultural procedures which are considered in the monograph include arsenic pentoxide, arsenic trioxide, calcium arsenate, dimethylarsinic acid (cacodylic acid), lead arsenate, the monosodium and disodium salts of methanearsonic acid (MAA), sodium arsenite, and sodium cacodylate (sodium salt of cacodylic acid). Heavy exposure to arsenical insecticides through the inhalation of lead, calcium and copper arsenate dust and through ingestion of contaminated wines has been reported among vineyard workers in Germany and France. Increased evidence of lung cancer has been found in these workers. Dermatological lesions were also common.

81-0203. Joshi, A. G.; Rege, M. S. (Dep. Zool., Inst. Sci., Bombay 400032, India) **Acute toxicity of some pesticides & a few inorganic salts to the mosquito fish *Gambusia affinis* (Baird & Girard).** *Indian J. Exp. Biol.* 18(4): 435-437; 1980 (29 references).

The toxicities of 11 pollutants to the mosquito fish were investigated. The pollutants studied included 4 chlorinated hydrocarbon pesticides [Thiodan 35EC (Al endosulfan), technical grade endosulfan, Intox 25 (DDT) and BHC], 4 heavy metal fungicides [PMA, Ceresan (a PMA formulation), Agallol (MEMC) and Blue Copper (copper oxychloride)], and 3 heavy metal salts (mercuric chloride, cupric sulfate and cupric nitrate). The chlorinated hydrocarbons caused identical symptoms of toxicity among the fish, including increased respiration rates and hypersensitivity. Respiratory distress and paralysis were evident in the final stages of poisoning. Fish exposed to the heavy metal compounds demonstrated sluggish movements and other symptoms different from those arising due to chlorinated hydrocarbon toxicity. Suggestions of neurological damage were present. All toxicants caused abortions in gravid females. Increasing the time of exposure from 24 to 96 hr for Thiodan 35EC, DDT, endosulfan, Agallol 3 and copper oxychloride increased the toxicity 1.14-1.87 fold. For cupric sulfate, mercuric chloride, PMA and Ceresan, the same increase in length of exposure increased the toxicity 3-4 fold.

81-0204. Mandal, P. K.; Kulshrestha, A. K. (Dep. Zool., Univ. Allahabad, Allahabad 211002, India) **Histopathological changes induced by sublethal Sumithion in *Clarias batrachus* (Linn.).** *Indian J. Exp. Biol.* 18(5): 547-552; 1980 (6 references).

Live specimens of the fish *Clarias batrachus* (Linn.) were exposed to 1 ppm Sumithion (fenitrothion). Pathological changes in the liver were characterized by necrosis becoming progressively more severe from day 45 to day 90. The kidney experienced marked abnormalities of the epithelial cells, with the orientation of the nuclei becoming irregular. The intestine demonstrated vacuolation of the epithelial cells of the villi. These findings agree with earlier reports of necrosis, vacuolation of hepatocytes and formation of multinucleate cells in the liver.

81-0205. Chand, B.; Ramachandran, M. (Biochem. Div., Natl. Ist. Commun. Dis., Delhi 110054, India) **Effect of dietary hexachlorocyclohexane on certain biochemical changes in albino rat.** *Indian J. Exp. Biol.* 18(7): 735-736; 1980 (8 references).

Albino rats were fed 50 ppm hexachlorocyclohexane (HCH; BHC) in their normal colony diet. The body fat, liver and serum of these rats were shown to contain significantly higher HCH levels than unfed controls. Body fat contained the maximum HCH level found, followed by the liver and serum. The body wt of HCH fed animals was higher than that of controls. Liver weights were also significantly increased. Higher values of the hepatic-microsomal enzyme *O*-demethylase were found in the HCH fed rats. It is suggested that these findings indicate a physiological adaptation by detoxifying the pesticide.

81-0206. Hanumante, M. M.; Deshpande, U. D.; Nagabhushanam, R. (Dep. Zool., Marathwada Univ., Aurangabad 431004, India) **Effect of DDT on oxygen consumption of normal & the pharmacologically treated marine pulmonate *Onchidium verruculatum*.** *Indian J. Exp. Biol.* 18(7): 753-754; 1980 (16 references).

Adult *Onchidium verruculatum* whose neurophysiological status was pharmacologically modified by pretreatment with reserpine, chlorpromazine or cyproheptadine-HCl, were exposed to DDT. When normal animals were exposed to DDT through 4 to 96 hr, a significant increase was noted in oxygen consumption. Exposure of pretreated animals to DDT for 6 hr elicited a significant depression in metabolism. It is suggested that in normal animals the DDT elevation of oxygen consumption arises due to increased secretion of oxygen consumption enhancing hormone (OCEH) from the left pleurovisceral ganglia. Other possible mechanisms of action are also considered.

81-0207. Foster, T. S.; Khan, S. U.; Akhtar, M. H. (Anim. Res. Inst., Res. Branch, Agric. Canada, Ontario K1A OC6, Canada) **Metabolism of de-ethyl-atrazine, de-isopropyl-atrazine, and hydro-atrazine by the soluble fraction (105,000 *g*) from goose liver homogenates.** *J. Agric. Food Chem.* 28(2): 1083-1985; 1980 (6 references).

Incubation of de-ethyl-atrazine [2-chloro-4-amino-6-(isopropyl)-*s*- triazine] and de-isopropyl-atrazine [2-chloro-4-(ethylamino)-6-amino-*s*-triazine] with the soluble fraction (105000 *g*) from goose liver homogenates resulted in the formation of the corresponding hydroxy analog. No dealkylation of hydroxy-atrazine [2-hydroxy-4-(ethylamino) -6-(isopropylamino) -*s*-triazine] occurred when it was incubated with the enzyme preparation. The data suggest that, in the metabolism of atrazine by the soluble fraction from liver homogenates, the formation of 2-hydroxy partially N-dealkylated metabolites occurs by the hydrolysis of the respective 2-chloro analogues rather than by partial N-dealkylation of hydroxy-atrazine. (Author abstract reprinted by permission of the American Chemical Society)

81-0208. Chin, B. H.; Tallant, M. J.; Duane, W. C.; Sullivan, L. J. (T. R. Evans Res. Cent., Diamond Shamrock Corp., Painesville, OH 44077) **Metabolism of carbamate insecticide thiofanox in rats.** *J. Agric. Food Chem.* 28(2): 1085-1090; 1980 (7 references).

The metabolic fate of thiofanox (P), 3,3-dimethyl-1-(methylthio)-2 butanone *O*-[(methylamino) carbonyl]oxime was investigated in the rat using [^{35}S]-, [*S-methyl*-^{14}C]-, or [*N-methyl*-^{14}C]P. The overall recovery of the ^{35}S, *S-methyl*-^{14}C-, and *N-methyl*-^{14}C- label was 91, 94 and 95% of the single dose, respectively. The majority of the dose was eliminated in the following day's urine after [^{35}S]P and [*S-methyl*-^{14}C]P administration. After [*N-methyl*-^{14}C]P administration, the majority of the dose was eliminated in the urine and CO_2 of expired air. Major metabolic pathways of P were oxidation (40%) and N-demethylation (35%) while S-demethylation (4%) was a minor pathway. The major oxidation product of P found in urine was its sulfoxide, 3,3-dimethyl-1-(methylsulfinyl)-2-butanone *O*-[(methylamino) carbonyl]oxime. Other minor urinary metabolites identified were oxime sulfoxide, oxime sulfone, and parent sulfone. Excretion of unidentified anionic products found in urine represents 20% of the dose. (Author abstract reprinted by permission of the American Chemical Society)

81-0209. Ivie, G. W.; Hunt, L. M. (Vet. Toxicol. & Entomol Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Metabolites of *cis*- and *trans*-permethrin in lactating goats.** *J. Agric. Food Chem.* 28(2): 1131-1138; 1980 (15 references).

Cis-(1*RS*)- and *trans*-(1*RS*)- permethrins, radiolabeled with ^{14}C in either the acid or alcohol moiety, are rapidly metabolized and excreted after oral administration to lactating goats. Twenty-six metabolites of the permethrin isomers are fully or partly characterized by thin layer chromatography and/or gas liquid chromatography mass spectrometry. The identified metabolites arise through hydrolysis of the ester linkage, hydroxylation at the *cis*- or *trans*-methyl of the geminal dimethyl group, and hydroxylation at the 4′ position of the phenoxybenzyl moiety. Certain of these products are further oxidized and/or conjugated with glycine, glutamic acid, glucuronic acid, or other unidentified compounds before excretion. Unmetabolized permethrin and certain ester metabolites are found in feces, milk, and fat from the treated goats, but only metabolites arising from ester hydrolysis are seen in urine. GLC mass spectral data are reported for the *cis*- and *trans*-permethrin isomers and 40 of their metabolites and analogs. (Author abstract reprinted by permission of the American Chemical Society)

81-0210. Ivie, G. W. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Fate of the plant growth regulator mefluidide {*N*-(2,4-dimethyl-5-(((trifluoromethyl) sulfonyl)amino)phenyl) acetamide} in a cow and sheep.** *J. Agric. Food Chem.* 28(2): 1286-1288; 1980 (12 references).

The plant growth regulator mefluidide {*N*-(2,4-dimethyl-5-(((trifluoromethyl) sulfonyl)amino)phenyl) acetamide}, in radiolabeled form, was administered in 5 consecutive daily oral doses to a cow and a sheep. The compound was rapidly absorbed and rapidly excreted by the animals; elimination was primarily through the urine and almost totally in the form of unmetabolized mefluidide. No detectable radiocarbon residues were secreted into the milk of the mefluidide-treated cow, and retention of radiocarbon residues by the tissues of both the cow and the sheep was minimal. Results in these studies suggest that potential interactions of mefluidide with ruminants from its use in agriculture will result neither in toxicological hazards to the exposed animals nor in contamination of meat or milk used for human consumption. (Author abstract reprinted by permission of the American Chemical Society)

81-0211. Chin, B. H.; Tallant, M. J.; Duane, W. C.; Sullivan, L. J. (T. R. Evans Res. Cent., Dep. Saf. Assess., Diamond Shamrock Corp., Painesville, OH 44077) **Anticholinesterase effects of carbamate insecticide thiofanox and its metabolites in rats.** *J. Agric. Food Chem.* 28(2): 1330-1332; 1980 (13 references).

The anticholinesterase activity of the carbamate insecticide thiofanox (P), 3,3-dimethyl-1-(methylthio) -2-butanone *O*-[(methylamino)carbonyl]oxime, and its three metabolites 3,3-dimethyl-1-(methylsulfinyl) -2-butanone *O*-[(methylamino) carbonyl]oxime (P_1), 3,3-dimethyl-1-(methylsulfonyl) -2-butanone *O*-[(methylamino) carbonyl]oxime (P_2), and 3,3-dimethyl-1-(methylsulfonyl)-2-butanone *O*-[(hydroxymethylamino) carbonyl]oxime (P_2OH) was investigated in the rat. The relative order of potency was $P_2 > P_1 > P > P_2OH$ for both the plasma ChE and RBC ChE. Time-dependent studies with P showed that maximum observed inhibition of cholinesterase (ChE) ac-

tivity of plasma and red blood cells (RBC) of the rat was attained at 30 min after the po administration of 1 mg/kg P in aqueous solution. The maximum depression of brain ChE activity was observed 1-2 hr post-dose. In all three tissues, complete recovery of ChE activity was attained at 24 hr after administration. (Author abstract reprinted by permission of the American Chemical Society)

81-0212. Howard, R. J.; Aist, J. R. (Exp. Stn., Biochem. Dep., E. I. du Pont de Nemours & Co., Wilmington, DE 19898) **Cytoplasmic microtubules and fungal morphogenesis: ultrastructural effects of methyl benzimidazole-2- yl carbamate determined by freeze-substitution of hyphal tip cells.** *J. Cell Biol.* 87(1): 55-64; 1980 (42 references).

Freeze-substituted hyphal tip cells of *Fusarium acuminatum* were used to study the effects of the fungicide component methyl benzimidazole-2-yl carbamate (MBC) at the ultrastructural level. Before treatment, numerous microtubules were seen throughout the cells. After 10 min of exposure to MBC most of the cytoplasmic microtubules no longer existed, except near spindle pole bodies. All microtubules were destroyed in the hyphal tip cells after 45 min exposure to MBC. The sub-apical cells still contained microtubules. These findings suggest that there are different turnover rates for cytoplasmic microtubules in subapical and apical cells. It is also indicated that microtubules near spindle pole bodies have a different turnover rate and that MBC acts to inhibit assembly of microtubules. Distributions of intracytoplasmic vesicles in thick sections of cells treated with MBC, D_2O or a combination of both were analyzed statistically. Findings lend support to the vesicle hypothesis of tip growth and establish a transport role for cytoplasmic microtubules in fungal morphogenesis.

81-0213. Prasad, O.; Srivastava, V. K. (Zool. Dep., Allahabad Univ., Allahabad, India) **Effect of insecticide (BHC) on the neurosecretory cells of ventral nerve cord of adult *Poekilocercus pictus*.** *J. Hirnforschung* 21(4): 409-416; 1980 (16 references).

Studies were performed to investigate the effect of BHC on the neurosecretory cells of *Poekilocercus pictus*. Adult males and females, 1-5 days old, were subjected to a 0.01 ml dose of 0.01% BHC solution, applied topically below the wings on the body cuticle. After incubation, ranging from 1-24 hr, the insects were dissected and the ventral nerve cord was removed and analyzed histologically. The results indicated that the insecticide initiates prolonged secretory activity which leads to complete exhaustion of secretory material, which is accompanied by cytomorphological alterations, including loss of turgidity, compactness of cells, undulations and rupture of the cell wall.

81-0214. Ashack, R. J.; McCarty, L. P.; Malek, R. S.; Goodman, F. R.; Peet, N. P. (Pharm. Res. & Dev., Dow Chem. Co., Indianapolis, IN 46268) **Evaluation of rotenone and related compounds as antagonists of slow-reacting substance of anaphylaxis.** *J. Med. Chem.* 23(9): 1022-1026; 1980 (33 references).

The effects of the insecticide rotenone and related compounds on the contractile response of isolated guinea pig ileum induced by chemical mediation of hypersensitivity are examined. The study was designed because rotenone is known to specifically inhibit slow-reacting substance of anaphylaxis (SRS-A); a specific inhibitor of SRS-A could be useful in treatment of asthma. The SRS-A (obtained by collection of peritoneal shock fluid from rats subjected to passive peritoneal anaphylaxis) was assayed on a strip of guinea pig ileum suspended in a tissue bath. The antagonists to be treated were added to the tissue baths 2 min prior to the SRS-A challenge. Activity was recorded by calculating the percent inhibition induced by the antagonist. In *in vivo* tests, guinea pigs which had received an aerosol challenge of an antigen to which they had been sensitized were treated with the antagonists, with prolongation of collapse times being recorded. The results indicate that several of the test compounds, most notably deguelin, prolonged collapse time. The results of the *in vitro* studies show that rotenone, dihydrorotenone, isorotenone, mutarotenone and deguelin are potent antagonists of SRS-A, but they also inhibit histamine, serotonin and acetylcholine. It is concluded that this lack of specificity does not warrant their further development as SRS-A antagonists.

81-0215. Hoover, K. L.; Ward, J. M.; Stinson, S. F. (Tumor Pathol. Branch, Carcinog. Test. Program. NCI, Bethesda, MD 20205) **Histopathologic differences between liver tumors in untreated (C57BL/6 x C3H)F_1 mice and nitrofen-fed mice.** *J. Natl. Cancer Inst.* 65(5): 937-948; 1980 (27 references).

Histopathological examinations were made of liver tumors in mice fed a control diet and in mice fed a diet containing 2348 ppm or 4696 ppm of 2,4-dichloro-1-(4-nitrophenoxy)benzene (nitrofen) for 78 wk. Following the treatment period, mice were maintained on nitrofen-free diet for 12 wk, with sacrifice at 90-92 wk. Complete necropsies were carried out, lung and liver tissue examined, and mitotic activity within the carcinoma was assessed. It was seen that the spontaneous tumors present in controls consisted predominantly of small basophilic cells containing oval or round nuclei, while the induced tumors generally consisted of solid sheets or nodules of frequently enlarged eosinophilic hepatocytes containing enlarged and/or hyperchromatic nuclei. Another difference found was that whereas metastases were not present in lungs of any controls, small emboli or large masses of neoplastic hepatocytes were present in up to 29% of treated mice with tumors. The evidence shows that liver tumors in treated and untreated mice are morphologically different, in-

dicating that nitrofen induces unique liver tumors rather than acting as a promoter of spontaneous neoplasms.

81-0216. Robinson, K. M.; Yarbrough, J. D. (Pharmacol. Sect., Dow Chem. Co., Indianopolis, IN 46268) **Liver protein synthesis and catabolism in mirex-pretreated rats with enlarging livers.** *J. Pharmacol. Exp. Ther.* 215(1): 82-85; 1980 (11 references).

Studies were performed to determine the effects of mirex-induced liver enlargement on amino acid incorporation and retention in rats. An iv dose of mirex (20 mg/kg) was given to the experimental group. Animals were given an ip injection of labeled L-(^{14}C) amino acid mixture 18 hr later. At specific times after injection the rats were killed and the livers were analyzed for radioactivity. Amino acids were incorporated into liver protein at the same rates in both mirex-treated rats and controls. However, the radioactivity was retained in the liver of the treated rats longer than in controls. By 48 hr, 81% of the maximum levels were still in the livers of treated rats, while only 53% of the radioactivity remained in the rats not receiving mirex. It is suggested that the almost 2-fold increase in liver total protein is due to a decrease in protein catabolism and not increased protein synthesis.

81-0217. Roslavtseva, S. A.; Kutizova, N. M.; Spirina, T. A.; Zolotova, T. B.; Shustova, V. I. (All-Union Res. Inst. Chem. Means Plant Prot., Moscow, USSR) **Rezistentnost' chernoi sveklovichnoi tli k ortenu i gardone. [Resistance of black beet aphids to Orthene and Gardonna.]** *Khim. Sel'sk. Khoz.* 18(9): 33-36; 1980 (16 references) (Russian).

The rate of development of resistance to the insecticides Orthene (acephate) and Gardonna (tetrachlorvinphos) was studied in black beet aphis *(Aphis fabae* Scop.). *Aphis* remained sensitive to both insecticides after prolonged selection (95 generations in the case of Orthene and 102 generations in the case of Gardonna). It was found that total esterase activity in *Aphis* subjected to selection with Orthene was decreased (125.1 IU) as compared with activity in the strain subjected to selection with Gardonna (170.8 IU) and activity in the initial sensitive strain (161.3 IU).

81-0218. Popov, P. V.; Shapovalova, G. K.; Abelentseva, G. M.*; Sedykh, A. S. (All-Union Sci. Res. Inst. Chem. Plant Prot., Moscow, USSR) **O vliyanii fungitsidov na toksichnost' insektitsidov. [Effect of fungicides on the toxicity of insecticides.]** *Khim. Sel'sk. Khoz.* 18(9): 36-37; 1980 (2 references) (Russian).

The toxicity of binary mixtures of insecticides [valexon (phoxim), pyrimiphos-methyl, phosalone, phthalophos (phosmet), TsGA 18809, benzophosphate and trichlorfon] with fungicides [zineb, copper chloroxide (copper-oxychloride), polycarbazine and BMC] was studied in houseflies by determining the LC40 during the 24 hr period following topical application of a benzene solution. The ratio of the insecticide to the fungicide in the mixture was 1:1.25 relative to the active ingredients. The fungicides caused no significant changes in the toxicity of the insecticides. The phytotoxicity of the fungicides was not increased by the insecticides.

81-0219. Partridge, G. G. (Dep. Genet., Univ. Liverpool, Liverpool L69 3BX, England) **Vitamin K deficiency syndromes in warfarin-resistant brown rats *(Rattus norvegicus).*** *Lab. Anim.* 14(3): 193-195; 1980 (12 references).

Observations on vitamin-K deficiency in warfarin-resistant rats are presented. Pups with appearance of bruises, which died within less than 20 wk, were shown to have died as a result of internal hemorrhaging. These animals had a low percentage clotting activity (PCA), < 20%, indicating a deficiency of vitamin K dependent blood clotting factors. The literature on the pertinent genetics controlling this phenomenon is reviewed.

81-0220. Stancel, G. M.; Ireland, J. S.; Mukku, V. R.; Robison, A. K. (Dep. Pharmacol., Med. Sch., Univ. Texas, Houston, TX 77025) **The estrogenic activity of DDT: *in vivo* and *in vitro* induction of a specific estrogen inducible uterine protein by *o,p'*-DDT.** *Life Sci.* 27(12): 1111-1117; 1980 (18 references).

Immature female rats were treated with 40 μg/kg 17β-estradiol ip in 0.1 ml DMSO or with 250 mg/kg DDT in DMSO. Animals were sacrificed 1 hr later. DDT stimulated the production of the uterine protein, inducible protein (IP). The IP is normally associated with an estrogenic response of the uterus. IP production was stimulated *in vivo* 1 hr after the administration of DDT. IP production *in vitro* was stimulated after 1 hr incubation of uteri with 100 μ*M o,p'*-DDT. Actinomycin D inhibited this response *in vitro*. IP production *in vitro* was not stimulated by *p,p'*-DDT. This is the first report of an estrogenic effect of *o,p'*-DDT in a completely *in vitro* system.

81-0221. Sampson, D. A.; Pitas, R. E.; Jensen, R. G. (Dep. Food Sci. & Nutr., Colorado State Univ., Fort Collins, CO 80523) **Effect of chronic ingestion of DDT on physiological and biochemical aspects of essential fatty acid deficiency.** *Lipids* 15(10): 815-822; 1980 (14 references).

Studies were performed to investigate the effects of DDT on fatty acid deficiency. Male weanling rats were fed various levels of essential fatty acids (EFA) and 150 ppm DDT. Growth rates were determined for 14 wk. After 14 wk the animals were weighed and sacrificed, and livers and

a portion of tail skin were removed and analyzed for lipids. The DDT did not affect EFA deficiency-induced reductions in growth rates, final body wt, or skin dermatitis. The DDT did increase the liver to body wt ratios. Although EFA deficiency also increased the ratio, EFA deficiency and DDT did not interact. The DDT treatment appeared to increase liver and tail levels of the fatty acids 18.0, 18:2 and 20:3ω9 and decrease levels of 12:0, 14:0, and 16:0. DDT in combination with EFA increased 18:2 levels. The authors contend that although the mechanisms are unclear, DDT appears to alter the metabolism of fatty acids.

81-0222. Luciak, M.; Kita, K.; Kita, I. (Inst. Pathol., Katowice, Poland) **Badania morfologiczne nad skrocona przewlekla toksycznoscia Chwastoxu D. [Morphological studies of chronic toxicity of Chwastox D.]** *Med. Pr.* 31(3): 177-184; 1980 (10 references) (Polish).

Toxicological evaluations were performed on the herbicide Chwastox D (MCPA). Rats received 15, 60, 240 and 960 mg/kg of the herbicide in their diets over a 13 wk period. Nonspecific patho-morphologic changes, such as disturbed circulation, retrogressive, progressive and inflammatory changes, developed in animals after 13 wk. These changes were found to be dose dependent. The maximum allowable dose for Chwastox D was set at 60 mg/kg.

81-0223. Halpert, J. R.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Sch. Med., Vanderbilt Univ., Nashville, TN) **Mechanism of the inactivation of rat liver cytochrome P-450 by parathion.** *Microsomes Drug Oxid. & Chem. Carcinog.* 1: 323-326; 1980 (11 references).

The mechanism of inactivation of rat liver cytochrome P-450 by parathion was investigated. Cytochrome P-450, purified from liver microsomes of phenobarbitol-treated rats, was incubated with 0.05 m*M* ^{35}S-parathion, and the activity of NADPH-cytochrome P-450 reductase was measured. The metabolism of parathion in the reconstituted system was accompanied by a loss of heme. A correlation between ^{35}S-binding and P-450 loss was also observed. Seventy-five percent of the covalently bound radioactivity could be dissociated with 5 m*M* dinitrothreitol without any restoration of the cytochrome P-450 or the enzyme activity.

81-0224. Bulger, W. H.; Muccitelli, R. M.; Kupfer, D. (Worchester Found. Exp. Biol., Shrewsbury, MA) **Activation of a proestrogen – methoxychlor (DDT analog) – by hepatic monooxygenase.** *Microsomes Drug Oxid. & Chem. Carcinog.* 2: 849-852; 1980 (20 references).

The activation of methoxychlor by hepatic monoxygenase was investigated in rats. Estrogenic assays were performed *in vivo* by measuring uterine weights and uterine ornithine decarboxylase activity. *In vitro* assays were performed by determining the inhibition of (^{3}H)-estradiol-17β binding to uterine cytosol 8S estrogen receptor. After incubation of uteri with the appropriate test compound, the distribution of uterine cytosolic (R_c) and nuclear (R_n) estrogen receptors was examined. Metabolism studies were conducted by incubating purified (^{14}C)- or (^{12}C)-methoxychlor with rat liver microsomes, then measuring formaldehyde and isolating metabolites. Results show that purified methoxychlor does not exhibit estrogenic action *in vitro*, but does demonstrate estrogenic activity *in vivo*. Methoxychlor is *O*-demethylated by rat liver microsomes, *in vitro*, into phenolic metabolites. These metabolites, mono- and didemethylated methoxychlor, exhibited estrogenic action *in vitro*. Only the didemethylated metabolite was shown to have estrogenic action both *in vivo* and *in vitro*.

81-0225. MacDonald, M. G.; Kaminsky, L. S. (Author address not given) **The development of hepatic mixed-function oxidases – warfarin metabolism as a probe.** *Microsomes Drug Oxid. & Chem. Carcinog.* 2: 857-860; 1980 (10 references).

The development of the mixed-function oxidase system was investigated, with particular emphasis on the metabolism of warfarin. At gestation ages 17, 18, 19, 20, 21 and 22 days post conception, the livers of rat pups removed from sacrificed pregnant females were used for microsome preparations. A second group of pups 23 to 55 days post conception were sacrificed and microsomal preparations completed. Cytochrome P-450 and cytochrome b_5 concentrations were determined. NADPH-cytochrome P-450 reductase activity was determined by following the rate of cytochrome c reduction. Warfarin hydroxylation activity, the R- and S-warfarin, and the metabolites were also assayed. Results indicate that 24-48 hr before parturition, increased hepatic microsomal content of mixed function oxidase components is triggered. Furthermore, cytochrme P-450 increased within 24 hr of birth, then again at the age of 55 days. Cytochrome b_5 was detectable at 18 days. The R-enantiomer of warfarin produced dehydrowarfarin. *In vitro* metabolism of S-warfarin was undetected prior to birth.

81-0226. Sweeney, G. D.; Jones, K. G.; Cole, F. M. (Dep. Med., McMaster Univ., Hamilton, Ontario, Canada) **Hepatotoxicity due to tetrachlorodibenzo(*p*)dioxin depends upon AHH responsiveness and nonhemoprotein iron.** *Microsomes Drug Oxid. & Chem. Carcinog.* 2: 903-906; 1980 (8 references).

Investigations of the role of chlorinated aromatic hydrocarbons [hexachlorobenzene and tetrachlorodibenzo-*p*-dioxin (TCDD)] on the induction of cytochrome P448 porphyria in rats were continued. Studies were performed to determine the role of AHH responsiveness and nonhemoprotein iron in the hepatotoxicity of TCDD. AHH

responsive and non-responsive mice were fed low iron diets with 0-0.25% elemental iron supplements. They were exposed to 5 levels of TCDD ranging from 0-100 μg/kg/wk. Urine was collected and analyzed for 20 wk, after which the animals were sacrificed. Livers were examined by light microscopy. The 25 μg/kg/wk dose caused only the AHH-responsive mice to develop porphyria, depressed uroporphyrinogen decarboxylase activity, and resulted in severe histological damage. Iron deficiency was shown to protect some strains of mice from the effects of TCDD. The AHH-responsive mice were affected by the synergistic activity of iron and TCDD which caused porphyria and tissue damage. It is concluded that chlorinated aromatic hydrocarbon induction of the hepatic mixed function oxidase system is closely associated with the toxic effects noted.

81-0227. Colbo, M. H.; Undeen, A. H. (Res. Unit Vector Pathol., Memorial Univ. Newfoundland, St. John's, Newfoundland ALC 5S7, Canada) **Effect of *Bacillus thuringiensis* var. *israelensis* on non-target insects in stream trials for control of Simuliidae.** *Mosq. News* 40(3); 368-371; 1980 (10 references).

Bacillus thuringiensis var. *israelensis* suspension was applied to a small stream in Newfoundland. A total of 3 applications at a concentration of 1×10^5 bacterial spores/ml were made during the spring and summer of 1979. Samples of non-target insects were taken 24 hr before treatment. Repeat samples were taken 3 and 7 days after treatment. No significant differences in the concentration of major groups of non-target insects could be found as a result of treatment with *B. thuringiensis* var. *israelensis*. There was no decrease in populations of Hydropsychidae and Philopotamidae, which feed by methods similar to those of the target organisms. The lack of toxicity exhibited in this study to non-target species suggest that it should be possible to extend blackfly control with *B. thuringiensis* var. *israelensis* to additional areas.

81-0228. Neu, I. (Neurol. Klin. & Poliklin., Klin. Grosshadern, Univ. Munchen, D-8000 Munich 70, BRD) **Neurologische Symptome bei Intoxikation. [Neurological symptoms of intoxications.]** *Muench. Med. Wochenschr.* 122(4): 1365-1370; 1980 (14 references) (German).

Neurological symptoms in acute and chronic poisoning are reviewed, and case reports are presented. Insecticides, such as alkyl phosphates, can cause cardiac arrhythmia, respiratory paralysis, cardiovascular insufficiency and muscular paralysis. The herbicides paraquat and diquat can cause cardiogenic shock, pulmonary edema, renal insufficiency and lung fibrosis. The effective antidotes include atropine for alkylphosphate and carbamate poisoning, and obidoxime chloride in the case of alkyl phosphate insecticides. A case of a painter who developed chronic poisoning due to contact with a vessel contaminated with parathion is presented. The poisoning symptoms were uncharacteristic. They included transient miosis, bradycardia and fascicular twitchings of the musculature. The diagnosis was established by determining the cholinesterase level.

81-0229. Bellincampi, D.; Gualandi, G.; La Monica, E.; Poley, C.; Morpurgo, G. P. (Ist. Super. Sanita, Ist. Orto Bot., Rome, Italy) **Membrane-damaging agents cause mitotic non-disjunction in *Aspergillus nidulans*.** *Mutat. Res.* 79(2): 169-172; 1980 (10 references).

The fungicides amphotericin B, pimaricin, fenarimol, miconazole and econazole were used to test the possibility of inducing mitotic non-disjunction in a diploid strain of *Aspergillus nidulans*. The findings indicated that these chemicals, which interfere with sterol synthesis or complex sterols, disturb normal cell division by altering the distribution of chromosomes and lead to mitotic non-disjunction. In all experiments, doses which decreased survival rate increased the occurrences of mitotic non-disjunction. The possibility that these chemicals could cause non-disjunction in higher organisms is suggested.

81-0230. Decloitre, F.; Hamon, G. (Inst. Rech. Sci. Cancer, F-94800 Villejuif, France) **Species-dependent effects of dietary lindane and/or zineb on the activation of aflatoxin B_1 into mutagenic derivatives.** *Mutat. Res.* 79(3): 185-192; 1980 (20 references).

Sprague-Dawley rats and Swiss mice were given diets containing lindane, 125 ppm, or zineb, 5200 ppm, or a mixture of both at the above-mentioned concentrations for 2 and 4 wk. The effect of pesticide ingestion on the ability of liver S9 to metabolize aflatoxin B_1 (AFB_1) into mutagenic derivatives was tested by the Salmonella (TA/100)/microsome test according to Ames. Control mouse-liver S9 was less efficient (13%) than the corresponding preparation from control rat liver. The ingestion of lindane produced a similar increase in the activities of both rat- (68%) and mouse-liver S9 (62%). Pretreatment with zineb inhibited (46%) rat-liver S9 but caused a marked increase (400%) in the activity of mouse-liver S9. Concomitant exposure to both pesticides showed that lindane released the inhibitory action of zineb on rat-liver S9 and reduced the stimulatory effect of zineb on mouse-liver S9. The inducing action of zineb in mice was a function of the dietary concentration of the pesticide. No effect was observed at dietary concentrations of zineb up to and including 500 ppm. (Author abstract by permission)

81-0231. Thust, R.; Mendel, J.; Schwarz, H.; Warzok, R. (Res. Group Prev. Oncol., Inst. Pathol., Med. Acad. Erfurt, DDR-50 Erfurt, DDR) **Nitrosated urea pesticide metabolites and other nitrosamides. Activity in clastogenicity and SCE assays, and aberration kinetics in**

Chinese hamster V79-E cells. *Mutat. Res.* 79(3): 239-248; 1980 (17 references).

Five nitrosoureas, as well as their non-nitrosated parent compounds, were checked for induction of chromosomal aberrations and sister-chromatid exchanges in V79-E cells without metabolic activation *in vitro*. For comparison, methylnitrosourea, ethylnitrosourea and nitrosocarbaryl were included in this study. Whereas the non-nitrosated agents were inactive, the nitroso derivatives were potent clastogens and inducers of SCEs. The dependence of aberration frequency on sampling time, which was studied for 5 nitroso compounds, revealed striking differences. As demonstrated by differential chromatid staining, the lag phase until maximal aberration rates may cover more than 2 cell cycles. Preventive oncological aspects of these nitrosamides and the mechanism of aberration kinetics are discussed. Urea compounds are widely used for pest control in agriculture. Dialkylphenylureas with different substituents, in particular, have herbicidal properties. In this paper, we report on the potency of alkylnitrosoarylureas to induce chromosomal aberrations and sister-chromatid exchanges in mammalian cells *in vitro*. In our program, these parameters serve as a pre-screening for carcinogenicity tests in animals. During these experiments it became obvious that the frequency of chromosomal aberrations drastically depends on the length of the post-treatment period and that the aberration kinetics of these closely related compounds may be very different. (Author abstract by permission, abridged)

81-0232. Hirai, K.; Shiaku, K.; Torii, M. (Sch. Parasitol., Fac. Med., Ehime Univ., Matsuyama, Ehime, Japan) **[Effects of organophosphorus insecticides and organochlorine insecticides on lipid metabolism. Part 3.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(3): 540-541; 1980 (Japanese).

It has previously been observed that fenitrothion affects adipose tissue lipase and lipoprotein lipase activity. The effects of various pesticides [EPN, parathion, mecarbam, fenitrothion, malathion, carbaryl, α- and β-BHC, γ-BHC (lindane) and endrin] on lipase were investigated. The substrate used for adipose tissue lipase determination was the intermediate layer of rat epididymal adipose tissue, homogenized in 0.25 mol sucrose in tris-HCL buffer at pH 7.4 and centrifuged at 12,000 *g*. Heparinized plasma was used as the substrate for lipoprotein lipase determination. Cholinesterase was inhibited by $10^{-5}M$ concentrations of the pesticides, in decreasing order of activity: mecarbam, carbaryl, fenitrothion, EPN, malathion and parathion. These compounds also inhibited nonspecific esterase *in vitro*. Carbaryl, parathion, mecarbam and fenitrothion enhanced lipoprotein lipase activity when present at low concentrations (10^{-6} to 10^{-5} *M*), and carbaryl and fenitrothion inhibited it at 10^{-3} *M*. EPN and malathion showed only a slight inhibition at the latter concentration, and mecarbam and parathion none at all. Carbaryl and fenitrothion inhibited adipose tissue lipase when present at 10^{-4} *M*. EPN, mecarbam and parathion produced slight inhibition at this level. Endrin and the BHC isomers had no effect on the lipoprotein lipase and adipose tissue lipase activities.

81-0233. Kawai, S.; Ueda, K.; Koyama, K.; Ogasawara, S. (Author address not given) **[Studies on preventive treatment of paraquat dichloride intoxication. Part 2.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(3): 546-547; 1980 (1 reference) (Japanese).

The Japanese government has issued an administrative instruction that an emetic be mixed into the agricultural formulation of paraquat. To test the effect of this admixture, the effect of an emetic, PP, mixed with paraquat dichloride was investigated in dogs. Based on preliminary test results the quantity of PP was selected as 2 g/kg body wt, since this was the amount which had induced vomiting in 5/5 dogs. Groups of dogs were fasted for 12 hr before testing or permitted feed and water ad libitum. From each group, male and female dogs were given paraquat at 40 mg/kg and PP at 2 mg/kg, and male and female dogs were given the same dosage of paraquat alone. The survival days (number of dogs × number of days before death) in dogs fasted for 12 hr before drug administration were >20 days for dogs given paraquat + PP and 15 days for those given paraquat alone. The survival days in the group fed ad libitum were 12.7 days for paraquat + PP and 6 days for paraquat alone. General symptoms such as vomiting and excessive nasal secretion were seen in all groups; however, bloody diarrhea and dyspnea were seen only in the PP group. The amount of paraquat discharged by vomiting was 86% of the dose administered in the paraquat + PP group fasted before administration and 61% in the paraquat + PP group fed ad libitum. The blood paraquat level averaged 44 ppm in the group taking paraquat alone, and 0.26 ppm in the paraquat + PP group. Thus the emetic was concluded to be effective in reducing the overall toxicity of agricultural paraquat formulations.

81-0234. Casida, J. E.; Ruzo, L. O. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Metabolic chemistry of pyrethroid insecticides.** *Pestic. Sci.* 11(2): 257-269; 1980 (61 references).

This review of studies on 20 pyrethroids with nine different acid moieties and ten different alcohol moieties reveals a diversity of functional groups undergoing metabolism in mammals, insects, other organisms, and microsomal esterase and oxidase systems. Seventy-nine metabolites have been identified from the isomers of permethrin; there are fewer from other pyrethroids examined in less detail. The sites and rates of metabolic attack on each pyrethroid depend on the organism or system. Metabolism of pyrethroids by esterase and oxidase action usually limits their toxicity to mammals more than to in-

sects, thereby conferring useful selective toxicity properties. (Author abstract by permission)

81-0235. Sternersen, J.; Oien, N. (Norwegian Plant Prot. Inst., N-1432 As, Norway) **Action of pesticides on earthworms. Part IV: Uptake and elimination of oxamyl compared with carbofuran.** *Pestic. Sci.* 11(4): 396-400; 1980 (9 references).

Uptake and excretion of the two carbamates, oxamyl and carbofuran, which differ greatly in their toxicity to earthworms, were studied in one worm species; the metabolism of oxamyl was studied in 6 worm species. Carbofuran was taken up by the worms at a much higher rate (13 times greater) than oxamyl when the worms were dipped in aqueous solutions of the pesticides. The relative rates of elimination were the same (half-life 2.5 hr). Metabolism of oxamyl was low in all the earthworms studied. The low rate of uptake may therefore be the main factor for the safety of oxamyl in respect of these important non-target organisms. (Author abstract by permission)

81-0236. Lord, K. A.; Briggs, G. G.; Neale, M. C.; Manlove, R. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Uptake of pesticides from water and soil by earthworms.** *Pestic. Sci.* 11(4): 401-408; 1980 (11 references).

The uptake of pesticides (fenuron, carbendazim, simazine, aldicarb, carbaryl, captan, diazinon, fenamiphos, chlorfenvinphos, folpet, captafol, parathion, phorate, hexachlorobenzene, dieldrin, aldrin, methyl pentafluorophenyl sulphone, 3,4-dichlorophneylurea, Dowco 275, 1,2,3,5-tetrachlorobenzene) by earthworms from aqueous solutions was examined and shown to be a reversible physical process. Measurements of distributions of pesticides between aqueous solutions and worm solids showed that adsorption coefficients were related to octanol-water distribution coefficients, as are soil-water distributions. From these relationships it was calculated that concentration factors of stable chemicals in earthworms from soil should be similar, except for polar substances which penetrate poorly, and be determined mainly by the soil organic matter content. Examination of uptake from soils indicated that the calculated concentration factors are unlikely to be achieved because of slow diffusion of chemicals in soils and because of metabolism in the soil or the worm. (Author abstract by permission)

81-0237. Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Induction of drug-metabolizing enzymes by insecticides and other xenobiotics.** *Pharmacol. Ther. Part A* 11(1): 43-107; 1980 (776 references).

An extensive review of drug metabolizing enzymes is presented. Differences in the toxicity of various chemicals may in some degree be explained by their different abilities to induce drug metabolizing enzymes. The ability of one chemical to influence the metabolism of another chemical in humans and animals is significant. This review considers the effects of inducers on drug tolerance and action; induction of drug metabolizing enzymes (DME) in mammals, vertebrates, and invertebrates; the induction of cytochrome-*c*-reductase heme synthesis and cytochrome P-450; induction of DME with chlorinated hydrocarbons, organophosphates and other insecticides and synergists; the effects of insecticides and other xenobiotics on steroid metabolism; the effects of inducers on other enzymes; and the induction of DME in extrahepatic tissues.

81-0238. Ginevan, M. E.; Lane, D. D.*; Greenberg, L. (Dep. Civil Eng., Univ. Kansas, Lawrence, KS 66045) **Ambient air concentration of sulfur dioxide affects flight activity in bees.** *Proc. Natl. Acad. Sci. USA* 77(10): 5631-5633; 1980 (14 references).

Studies were performed in which the effects of sulfur dioxide (SO_2) on the flight activity of bees were investigated. SO_2 concentrations at 0.14 and 0.28 ppm were maintained in large experimental chambers in which the bees were observed. Flight activity (as % flight activity) was reduced significantly by both concentrations. It is suggested that insect studies (particularly those which consider behavioral parameters) could serve as indicators for air pollution.

81-0239. Romeo, G. (Ist. Clin. Neurol., Bologna, Italy) **The hepatic porphyrias.** *Prog. Med. Genet.* 4: 169-197; 1980 (89 references).

Clinical and laboratory features of hepatic porphyrias are described. Sporadic porphyria was reported in an outbreak in 1956 involving several thousand people who had eaten bread containing hexachlorobenzene. The chemical had been applied as a fungicide to wheat. The porphyrinogenic property of HCB was demonstrated by producing experimental hepatic porphyria in rats. TCCD (a contaminant of 2,4,5-T) was also porphyrinogenic as demonstrated in laboratory tests. TCDD was responsible for outbreaks of cutaneous porphyria in herbicide factories and in Vietnam and Seveso, Italy. The distinction between genetic and acquired porphyria cutanea tarda is discussed.

81-0240. Kurlowicz-Sidun, B. (Inst. Biostruct, Med. Acad., Bialystok, Poland) **Badania morfologiczne i histochemiczne watroby szcura w ostrm i przewleklym zatruciu fungicydem – octanem fenylortecoiwym. [Liver morphology and histochemistry in rats acutely or chronically intoxicated with a fungicide – phenylmercuric acetate.]** *Rocz. Akad. Med. B* 23: 187-202; 1979 (41 references).

Studies were performed to determine the effects of phenylmercuric acetate (PMA) on rat livers. The fungicide was administered by gastric tube in a physiological saline. Metabolic disturbances resulted from both acute and chronic dosages. The activity of succinic and lactic dehydrogenases as well as acid phosphatase enzymes was altered. The activity of glucogen and the SH and SS groups of protein were also altered. Hyperaemia, small extravasations, parenchymal and fatty degeneration and necrosis of single cells were observed for up to 20 days after the last acute dose and 3 mo after the last chronic dose.

81-0241. Senczuk, W.; Pogorzelska, H. (Dep. Toxicol., Inst. Bioanal. & Environ. Res., Acad. Med., Poznan, Poland) **Budowa chemiczna a toksykodynamiczne wlasciwosci pochodnych kwasow fenoksykarboksylowych. [Chemical structure and toxicodynamic properties of derivatives of phenoxycarboxylic acids. Part I. Acute toxicity and cumulation coefficient.]** *Rocz. Panstw. Zakl. Hig.* 31(4): 373-377; 1980 (8 references) (Polish).

Acute toxicities were determined for 2,4,5-T, 2,4-D, MCPA, 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP; silvex), 2,4-dichlorophenoxypropionic acid (2,4-DP; dichlorprop) and MCPP (mecoprop). Acute multiple-dose toxicities were determined on male white mice using movable mean values according to Thompson and Thomspon-Weil. The results of the toxicity testing placed these herbicides into toxicity class III according the the classification of Hodge and Sterner. The trichloro derivatives of phenoxyacetic acid as well as the phenoxypropionic acids (2,4,5-T and 2,4,5-TP) had the highest toxicities among the tested substances. The cumulation of these compounds in the test organisms was also the highest. Methylchloro derivatives of both acids had the lowest toxicities. It is suggested that substitution of methyl groups for chlorine reduces the toxic effect. The type of organic acid present in the molecule is concluded not to be extremely significant in the toxicity of the compound.

81-0242. Mlynarczyk, W.; Sadowski, C.; Senczuk, M. (Dep. Toxicol., Inst. Bioanal. & Environ. Res., Acad. Med., Poznan, Poland) **Pomiary zawartosci jodu zwiazanego z bialkiem w doswiadczalnym zatruciu ferbamem 76. [Measurements of protein-bound iodine content in experimental poisoning with ferbam 76.]** *Rocz. Panstw. Zakl. Hig.* 31(4): 379-380; 1980 (8 references) (Polish).

The effect of ferbam 76 on the serum level of protein-bound iodine in male Wistar rats was examined. Protein bound iodine was measured after dry alkaline mineralization. The measurement was based on Sandell-Kolthoff reaction. The fungicide was administered by one intragastric gavage treatment and in subacute short-term tests. The serum level of protein-bound iodine was increased, suggesting that ferbam 76 affects the thyroid gland, causing its hyperfunction.

81-0243. Mahanty, H. K.; Evans, G. (Bot. Dep., Univ. Canterbury, Christchurch, New Zealand) **Intra-generic variations of sensitivity to polychlorinated biphenyls (PCBs) and DDT in soil Baccilli.** *Soil Biol. Biochem.* 12(5): 521-522; 1980 (20 references).

The effects of PCBs and DDT were examined in three bacterial isolates obtained from a soil sample. Two isolates were identified as belonging to the *Bacillus subtilis* group, and one as *Bacillus mycoides*. Stock solutions of DDT and PCBs (0.1-2.5 μg/ml) in methanol were added to flasks of sterile nutrient broth inoculated with an 18-hr culture of bacteria. At various intervals, samples were withdrawn aseptically, serially diluted, and plated out on nutrient agar plates to estimate the number of viable cells. Cell optical densities were also determined. Isolate GBML-1 *(B. subtilis)* showed sensitivity to both PCBs and DDT at 0.25 μg/ml. Isolates GBML-2 *(B. subtilis)* and GBML-3 *(B. mycoides)* were sensitive to 1.0 μg/ml PCB, but were totally resistant to 2.5 μg/ml DDT. The results show for the first time that soil bacteria belonging to the genus *Bacillus* and living in a similar environment exhibit a differential response to PCBs and DDT.

81-0244. Hirata, S. Y.; Fujimoto, T. (Clin. Dento-Oral Surg., Med. Sch., Kumamoto Univ., Kumamoto, Japan) **Effects of methylmercuric chloride on palate closure in mice.** *Teratology* 22(1): 16A; 1980.

Our previous reports have shown that a single oral administration of 25 mg/kg methylmercuric chloride (MMC) to pregnant ICR-mice on day 10 of pregnancy induces an extremely high incidence of cleft palate in fetuses and that such cleft palate-induction is ascribable to retardation of horizontalization of the embryonic palatal shelves. The present study aims primarily to analyze the causes of retardation of the palate horizontalization. In embryos on day 14 of pregnancy from untreated mice, the palatal shelves already are fused to form the palate anlage, while in embryos at the same developmental stage from MMC-treated dams, the palatal shelves were still in the process of horizontalization and the anterior region of the shelves appeared to be remarkably retarded in the horizontal movement. Based on these results, the anterior palatal region of the 14-day-embryos from the MMC-treated dams was specially examined with the transmission electron microscope. Ultrastructural changes were observed in the nucleus and nuclear membrane of the mesenchymal cells of the palatal shelves; these were partial aggregation of chromatin, separation of the outer from the inner leaflet of the nuclear membrane and evagination or bulge-formation into the cytoplasm by the nuclear membrane. It is speculated that these morphological changes in the mesenchymal cells closely relate to possible temporal disturbance

of horizontalization of the palatal shelves. (Author abstract by permission)

81-0245. Hanzlik, R. P.; Cashman, J. R.; Traiger, G. J. (Dep. Med. Chem., Univ. Kansas, Lawrence, KS 66045) **Relative hepatotoxicity of substituted thiobenzamides and thiobenzamide-*S*- oxides in the rat.** *Toxicol. Appl. Pharmacol.* 55(2): 260-272; 1980 (25 references).

The toxic effects of 2,6-disubstituted thiobenzamides were investigated. Male Sprague-Dawley rats were injected ip with 1.0 mmol/kg of 2,6-dichlorothiobenzamide (Prefix; chlorthiamid), 2-chloro-6-methylthiobenzamide and 2,6-dimethylthiobenzamide. The animals were sacrificed 24 hr later and bilirubin levels and GPT activities were measured to indicated the degree of hepatotoxicity. For Prefix, the bilirubin level was 0.34 ± 0.04 mg/100 ml and GPT activity was 23 ± 3 units/ml, control values were 0.18 ± 0.01 mg/100 ml and 27 ± 3 units/ml for the 2 indices, respectively. None of the 2,6-disubstituted compounds tested were found to be hepatotoxic. The apparent lack of toxicity could be the result of either steric or electronic factors associated with the 2,6-substitution. Further studies on these effects are needed. Studies on the mechanisms of toxicity of thiobenzamide derivatives were also performed.

81-0246. Menna, J. H.; Moses, E. B.; Barron, A. L. (Dep. Microbiol. & Immunol., Univ. Arkansas Med. Sci., Little Rock, AR 72205) **Influenza type A virus infection of suckling mice preexposed to insecticide carrier.** *Toxicol. Lett.* 6(6): 357-363; 1980 (17 references).

The exposure of suckling CD-1 outbred mice to AAA, an insecticide carrier consisting of equal parts of Atlox 3403f with Atlox 3409f and the solvent Aerotex 3470, enhanced the survival of the mice to influenza type A/PR8/34 virus infection. A direct correlation was noted between the percentage of mice surviving and the concentration of AAA to which they were exposed. Treatment of mice with AAA at concentrations of 1.4 and 2.1% increased the likelihood of survival against influenza by factors of 3.18 and 3.89, respectively, over controls.

81-0247. Chowdhury, J. S.; Dedeja, P. K.; Mehta, S. K.; Mahmood, A. (Dep. Biochem. & Gastroenterol., Postgrad. Inst. Med. Educ. & Res., Chandigarh 160012, India) **Effect of a single oral dose of malathion on D-glucose and glycine uptake and on brush border enzymes in rat intestine.** *Toxicol. Lett.* 6(6): 411-415; 1980 (17 references).

Male albino Wistar rats were given 1 g/kg doses of malathion mixed with corn oil via stomach tube. The animals were fasted overnight and sacrificed 48 hr after dosing. Glucose and glycine absorption were depressed 35% in malathion-exposed animals. A marked reduction was noted in sucrase, lactase and alkaline phosphatase activities. Intestinal lactate dehydrogenase and Mg^{2+}-ATPase activities were also significantly reduced. No change was noted in the leucine aminopeptidase levels. Evidence indicates that malathion produces its inhibitory effects through action at the metabolic level.

81-0248. Davis, M. E.; Berndt, W. O.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol, Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Disposition and nephrotoxicity of hexachloro-1,3- butadiene.** *Toxicology* 16(3): 179-191; 1980 (22 references).

Male Sprague-Dawley rats were given hexachloro-1,3- butadiene (HCBD) by ip injection at a dose of 300 mg/kg in corn oil. Four hr after administration, urine osmolality was significantly decreased and maximal reductions were observed at 24 hr; this level was sustained through 48 hr. The volume of urine collected during the first 24 hr after administering HCBD was twice that collected from controls. Food consumption was significantly decreased in treated rats, from 25 g ingested before HCBD to 9 g during the first 24 hr after dosing. Significant weight reductions occurred. HCBD excretion into the bile and urine, determined by [^{14}C]HCBD tracer doses, was lessened after HCBD treatment. From these findings it was concluded that HCBD rapidly induces nephrotoxicity. HCBD was biotransformed into polar metabolites in the rat.

81-0249. de Ferreyra, E. C.; de Fenos, O. M.; Castro, J. A. (Lab. Quim. Biotoxicol., CITEFA, Zufriategui & Varela, Villa Martelli, Pcia. Buenos Aires, Argentina) **Effect of different chemicals on thioacetamine-induced liver necrosis.** *Toxicology* 16(3): 205-214; 1980 (21 references).

Male Sprague-Dawley rats were dosed with various inhibitors of cytochrome P-450 mediated oxidative transformations. Thioacetamide induced necrosis was not prevented by ethyl 2-diethylaminoethyl- 2-phenyl-2-ethylmalonate, ethyl-2-diethylaminoethyl-2-ethyl-2-butylmalonate, 2,4-dichloro-6-phenoxyethyl diethylamine, 2-diethylaminoethyl- 2-phenyl-2-(2-propene) -4-penten-1-oate or 3-amino-1,2,4-triazole (amitrole). This findings was evidence either by isocitric acid dehydrogenase activity or histological examination. Various other sulfur compounds did prevent thioacetamide induced liver necrosis at 24 hr. Some of these were tetraethyl thiuram disulfide (disulfiram), diethyldithiocarbamic acid (DDC), thiourea, and 1-methyl-2-mercaptoimidazole. Diphenhydramine, nicotinamide, trimethylamine and imipramine did not protect. Each of the chemicals tested did prolong phenobarbital sleeping time. These findings suggest that cytochrome P-450 is not a major factor in the activation of thioacetamide to a proximal or ultimate necrogenic metabolite.

81-0250. Trottier, B.; Fraser, A. R.; Planet, G.; Ecobichon, D. J. (Dep. Chim., Univ. Moncton, Moncton, New Brunswick E1A 3E9, Canada) **Subacute toxicity of technical fenitrothion in male rats.** *Toxicology* 17(1): 29-38; 1980 (15 references).

Young male CD rats were used to test the effects of the insecticide fenitrothion on hepatic function. Rats received oral doses (2.5, 5.0, 10.0 or 20.0 mg/kg/day) of fenitrothion for 30 consecutive days. Animals were sacrificed at 8, 15, 22 and 30 days of treatment and at 8, 15, 29, 57 and 85 days after treatment was terminated. Blood samples were analyzed for biochemical parameters of hepatic function; brain plasma and erythrocyte cholinesterase and hepatic and renal carboxylesterases were assayed; and liver, kidney and brain tissues were examined histologically. Animals in the 2.5-10.0 mg/kg groups exhibited mild toxicity. At the 20.0 mg/kg level 8 of 36 animals died in wk 1 of the treatment regimen. Overt cholinergic signs, including salivation, piloerection, diarrhea, ataxia, generalized tremors, and chronic convulsions were observed in this group. A dose-dependent decrease in tissue esterase activity was observed throughout the treatment period; tissue esterase activities returned to normal levels 1-2 wk after termination of treatment. Serum biochemistry and histology sections showed no significant treatment-related changes. It was concluded that fenitrothion, administered for 30 days at the doses tested, caused few observed deleterious effects to male rats other than the inhibitory effects which commonly follow administration of any anticholinesteratic agent.

81-0251. Lamb, M. J.; Lilly, L. J. (Zool. Dep., Birkbeck Coll., London WC1E 7HX, England) **An investigation of some genetic toxicological effects of the fungicide benomyl.** *Toxicology* 17(1): 83-95; 1980 (24 references).

The mutagenic effects of benomyl and its degradation product, MBC, were investigated on *Drosophila melanogaster.* Benlate (~ 50% benomyl) was mixed with dimethyl sulfoxide (DMSO) and water to a a final concentration of 1 mg/ml Benlate in 0.5% DMSO; a 0.5 mg/ml suspension of MBC in DMSO was prepared in a similar manner. After 16 hr of food and water deprivation, adult male *Drosophila* were exposed to the test solutions. *Drosophilia* sex-linked recessive tests indicated no increase in recessive lethal frequency after feeding on the benomyl or MBC formulations. No increases in chromosome breakage or loss were detected in the treated males In a second test, human lymphocytes were cultured in MBC (0.5 mg/kg) and DMSO (0.5%). No increases of cells with chromosomal aberrations were observed. It is concluded that benomyl and MBC are not strong mutagens.

81-0252. Longmuir, I. S.; Gottlieb, S. F.; Pashko, L. L.; Martin, P. (Dep. Biochem., North Carolina State Univ., Raleigh, NC 27650) ***In vivo* and *in vitro* induction of cytochrome P-450 synthesis in hyperoxia.** *Undersea Biomed. Res.* 7(3): 161-170; 1980 (17 references).

Male Swiss-Webster mice which had been light-adapted or dark-adapted for 1 wk were used in studies designed to determine the effects of hyperoxia on the induction of cytochrome P-450. Mice, in pressure chambers, were exposed to 1-3 ATA oxygen for 15 min to 4 hr, decompressed at a rate of 1.0 ATA/min, and then sacrificed. The livers were analyzed for cytochrome P-450. The results indicate that hyperoxia significantly increased the liver concentration of P-450 of dark- and light-adapted mice, with the concentration first peaking and then decaying. The rate of decay appeared to be independent of PO_2, and induction was found to be a specific effect of increased O_2 tensions and was not to pressure per se. The oxygen induction of P-450 was inhibited by ip administrations of disulfiram (300 mg/kg) or metyrapone (300 mg/kg). Isolated hepatocytes were used to test the effect of inhibitors of protein and heme synthesis on O_2 induction of cytochrome P-450 *in vitro.* Actinomycin D and cycloheximide inhibited oxygen induction of P-450, whereas aminotriazole (amitrole) did not.

81-0253. Renner, G. (Pharmacol. Inst., Univ. Muenchen, D-8000 Munich 2, BRD) **Metabolic studies on pentachloronitrobenzene (PCNB) in rats.** *Xenobiotica* 10(7-8): 537-550; 1980 (25 references).

The metabolism of PCNB (quintozene) in rats was studied. Metabolites isolated from rat excreta and identified were *N*-acetyl-*S*-(pentachlorophenyl)cysteine, pentachlorothiophenol, pentachlorothioanisole, 2,3,4,5-tetrachlorothiophenol, 2,3,4,5-tetrachlorothioanisole, 2,3,4,6- and/or 2,3,5,6-tetrachoro- thiophenol and -thioanisole, 1,4-bis(methylthio) tetrachlorobenzene, 1,4-dimercaptotetrachlorobenzen and/or 4-methylthio-tetrachlorothiophenol, pentachlorophenol (PCP), pentachloroanisole, 2,3,4,5-tetrachlorophenol, 2,3,4,5-tetrachloroanisole, 2,3,4,6- and/or 2,3,5,6-tetrachloro- phenol and -anisole, pentachlorobenzene, 2,3,4,5-tetrachloronitrobenzene, pentachloroaniline and 2,3,4,5-tetrachloroaniline. (Author abstract by permission)

81-0254. Renner, G. (Pharmakol. Inst., Univ. Muenchen, D-8000 Munich 2, BRD) **Toxicities of combinations of pentachloronitrobenzene with mercuric chloride or cadmium chloride, and hexachlorobenzene with mercuric chloride administered to rats.** *Xenobiotica* 10(7-8): 551-556; 1980 (3 references).

Pentachloronitrobenzene (PCNB; quintozene) and $HgCl_2$ (mercuric chloride), PCNB and $CdCl_2$ (cadmium chloride), and hexachlorobenzene (HCB) and $HgCl_2$ were investigated for their acute oral toxicity in rats, individually and as combinations in various ratios of the organochlorine pesticides to the heavy metal chlorides. The

toxicity of mixtures of low dosages of the pairs tested was higher than the sum of the toxicities produced by the individual doses. At increased dosages of the components in the combinations PCNB-$HgCl_2$ and PCNB-$CdCl_2$, the combined lethality tended towards the sums of the effects of the individual doses. (Author abstract by permission)

81-0255. Mueller, W.; Nohynek, G.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen. & Unweltforsch. mbH, Holloman AFB, NM 88330) **Aufnahme, Verteilung, Umwandlung und Ausscheidung von Dieldrin in nicth meschlichen Primaten and anderen Labortieren. [Absorbtion, body distribution, metabolism, and excretion of dieldrin in non-human primates and other laboratory animals.]** *Z. Naturforsch. Teil C* 34: 340-345; 1980 (28 references) (German).

The resorption, distribution in the body, excretion and metabolism of ^{14}C-labeled dieldrin were investigated qualitatively and quantitatively on mice, rats, rabbits, rhesus monkeys and chimpanzees. All animals received a single oral dose of dieldrin at 5 mg/kg body wt. Scintillation counts on feces and urine revealed the presence of dieldrin in feces only. Three radioactive zones were found on TLC plates prepared for urine and feces extracts. They corresponded to 3 metabolites; 12-hydroxy-dieldrin (I), 4,5-trans-dihydro-aldrinol (II), and a glucuronic acid conjugate of the diol (III); In rhesus monkeys, metabolism of dieldrin administered at 2 ppm in the diet for 260 days was studied. Levels were found to be high in the thymus, bone marrow, lymph nodes, and abdominal subcutaneous fat. A comparison of biotransformation and elimination of dieldrin in mice, rats, rabbits and primates revealed that while mice and rabbits eliminated dieldrin primarily as metabolite II, rats and primates excreted mostly metabolite I. The difference in pathologic effects of dieldrin on the livers of rats and monkeys disclosed that rats are not a suitable model for predicting the toxic effects of dieldrin on humans, and thus non-human primates must be used as models.

See also 81-0005, 81-0006, 81-0008, 81-0016, 81-0017, 81-0018, 81-0019, 81-0020, 81-0021, 81-0023, 81-0025, 81-0031, 81-0033, 81-0034, 81-0035, 81-0037, 81-0038, 81-0044, 81-0045, 81-0046, 81-0048, 81-0050, 81-0051, 81-0053, 81-0054, 81-0062, 81-0069, 81-0082, 81-0086, 81-0124, 81-0127, 81-0131, 81-0135, 81-0144, *and* 81-0298.

81-0256. Bacaioni, A.; Goretti, G.; Lagana, A.; Petronio, B. M.; Rotatori, M. (Ist. Chim. Anal., Univ. Roma, I-00185 Rome, Italy) **Sorption capacities of graphitized carbon black in determination of chlorinated pesticide traces in water.** *Anal. Chem.* 52(13): 2033-2036; 1980 (17 references).

The application of graphitized carbon black (GCB) to the extraction of trace organic pollutants from water is studied. It is observed that many classes of organic substances are adsorbed and, in particular, that GCB is a good material for the recovery of chlorinated pesticides. Although the adsorbent efficiencies depend on the nature of other substances that are present in the water samples, GCB has proven to be more advantageous than Tenax for pesticide determinations. (Author abstract reprinted by permission of the American Chemical Society)

81-0257. Oliver, B. G.; Bothen, K. D. (Water Chem. Sect., Environ. Contam. Div., Canada Cent. Inland Waters, Burlington, Ontario L7S 1A1, Canada) **Determination of chlorobenzenes in water by capillary gas chromatography.** *Anal. Chem.* 52(13): 2066-2069; 1980 (11 references).

A capillary gas chromatographic method with electron capture detection has been developed for separating and quantitating all 12 chlorobenzenes in water samples after preconcentration into pentane. Concentration factors from water of 1000 or 2500, respectively, are achieved by using a small column of Chromosorb 102 or by liquid-liquid extraction with pentane. Detection limits of the technique are ≅ 0.01 ng/l (ppt) for penta- and hexachlorobenzene, ≅ 0.05 ng/l for the tetrachlorobenzenes, ≅ 0.1 ng/l for the trichlorobenzenes, ≅ 1 ng/l for the dichlorobenzenes, and ≅ 500 ng/l for monochlorobenzene. (Author abstract reprinted by permission of the American Chemical Society)

81-0258. Anderson, J. L.; Chesney, D. J. (Dep. Chem., North Dakota State Univ., Fargo, ND 58105) **Liquid chromatographic determination of selected carbamate pesticides in water with electrochemical detection.** *Anal. Chem.* 52(13): 2156-2161; 1980 (37 references).

A reverse-phase liquid chromatographic method with electrochemical detection is described for the trace determination in water of selected examples of the important and ubiquitously applied carbamate class of agricultural pesticides. The thin-layer, Kel-F-graphite electrochemical detector is operated in the oxidative, constant-potential amperometric mode at + 1.1 V *vs.* Ag/Ag/Cl/3.5 *M* KCl. Calibration curves are linear over a wide range of sample concentration – typically at least 3 orders of magnitude – with relative standard deviations for repetitive determinations of 1-2% through most of the range. Detection limits in the range of 40-150 pg (signal/noise ratio 2:1) have been obtained for test carbamates, corresponding to sample concentrations of 2-7 ppb, using simple and inexpensive equipment. Detection limits are controlled by pump noise resulting from fluctuations in background water oxidation current. (Author abstract reprinted by permission of the American Chemical Society)

81-0259. Gearhart, H. L.; Cook, R. L.; Whitney, R. W. (Dep. Chem., Oklahoma State Univ., Stillwater, OK 74078) **Automated sequential sampler for gas chromatographic determination of trace airborne pesticides.** *Anal. Chem.* 52(13): 2223-2225; 1980 (9 references).

A new, sequential, accumulative air sampler which was designed for operation within enclosures is described. The sampler is based on the principle of stripping and concentrating volatile compounds from the air in a suitable concentration medium which is subsequently available for chromatographic analysis. The device has the capability for direct and continuous air flow rate measurement and integration and sample volume totalization. It is portable and is adaptable for use with liquid concentration media also. One disadvantage of the sampler is that repetitive determinations are not possible for a given sample. However, positive aspects of this technique include minimum sampling time and accurate sample volume determination.

81-0260. Needham, L. L.; Smrek, A. L.; Head, S. L.; Burse, V. W.; Liddle, J. A. (Cent. Dis. Control, Public Health Serv., US Dep. Health & Hum. Serv., Atlanta, GA 30333) **Column chromatography separation of polychlorinated biphenyls from dichlorodiphenyltrichloroethane and metabolites.** *Anal. Chem.* 52(13): 2227-2229; 1980 (14 references).

The use of silver nitrate on silica gel columns to separate PCBs from DDT and metabolites in bovine serum is described and compared to 2 other methods. The method has yielded high recoveries of PCBs, with no interference from chlorinated hydrocarbons. Good reproducibility among batches of prepared silver nitrate on silica gel were noted. Samples containing PCBs at concentrations < 5 ppb were routinely detected.

81-0261. Cotterill, E. G. (Agric. Res. Counc., Weed Res. Org., Yarnton, Oxford OX5 1PF, England) **Determination of diuron residues in soil: comparison of determinations by high-performance liquid chromatography and gas-liquid chromatography.** *Analyst (London)* 105(1255): 987-990; 1980 (11 references).

Soil samples were analyzed for diuron by high performance liquid chromatography (HPLC) and gas liquid chromatography (GLC) to determine a reliable method of measurement for the herbicide. Soils were extracted with

methanol, evaporated, then re-dissolved in hexane for GLC or in the HPLC eluent for HPLC determination. Recovery means did not vary between the methods; variance within the means was greatest for GLC. Diuron could be analyzed by HPLC in soils with high organic matter contents without cleanup. The limit of detection, 0.04 μg/g, was achieved with either method.

81-0262. Norheim, G.; Okland, E. M. (Natl. Vet. Inst., Oslo 1, Norway) **Rapid extraction of some persistent chlorinated hydrocarbons from biological material with low fat content.** *Analyst (London)* 105(1255): 990-992; 1980 (11 references).

A method for rapid extraction of hydrocarbons from low fat-content biological samples is described. The method includes the solubilization of the sample in concentrated sulfuric acid for 4 hr at 60°C. Heptane in then introduced and the mixture is shaken and then centrifuged. At this point, the sample is ready for gas chromatography. This rapid method requires small amounts of reagents and little equipment. The method was tested on homogenized cod flesh; recoveries of HCB (hexachlorobenzene) and octachlorostyrene were 95%. A limitation of this method is that DDT is partially degraded during digestion and it cannot be determined accurately.

81-0263. Harvan, D. J.; Hass, J. R.; Albro, P. W.; Friesen, M. D. (Environ. Chem. Branch, NIEHS, Research Triangle Park, NC 27709) **Mass spectrometry of di-(2-ethylhexyl) phthalate metabolites.** *Biomed. Mass Spectrom.* 7(6): 242-246; 1980 (17 references).

Nine metabolites of the acaricide di-(2-ethylhexyl) phthalate (dioctyl phthalate) were studied by electron impact, methane positive chemical ionization, oxygen negative chemical ionization and collision induced dissociation mass to determine their kinetic energy spectra. The findings based on selected fragment ions were used to obtain structural information.

81-0264. Gnusowski, B.; Zygmunt, B. (Dep. Anal. Monit., Inst. Herb Ind., PL-61707 Pozan, Poland) **Oznaczanie pozostalosci chlortoluronu (Dicuranu) w leczniczych surowcach roslinnych. [Determination of chlorotoluron (Dicuran) residues in medicinal plants.]** *Bromatol. Chem. Toksykol.* 13(1): 19-23; 1980 (15 references) (Polish).

A determination method for chlorotoluron residues in medicinal plants is presented. Samples were fortified with Dicuron 80WP, (containing 80% of the urea herbicide chlorotoluron). Dicuran is in toxicity class V, but is not toxic for bees. This analytical method for the determination of chlorotoluron residues permits detection of 0.25 mg in 10 g samples, with an average error of 8.4% and an average recovery of 97.2%, by fortifying the samples with 0.5 μg and 1.0 μg of standard substances. The described method involves the extraction of the herbicide with naphtha ether; the alkaline hydrolysis to liberate 3-chloro-4-methylaniline from chlorotoluron; its purification of ballast substances; and the colorimetric determination of the complex compound of *N*-(1-naphthyl)-ethylenediamine dichlorohydride.

81-0265. Gnusowski, B. (Dep. Anal. Monit., Inst. Herb Ind., PL-61707 Poznan, Poland) **Metoda oznaczania pozostalosci propyzamidu w zielarskich surowcach leczniczych i przyprawosych oraz w glebie. [A method for the determination of propyzamide residues in medicinal plants and in soil.]** *Bromatol. Chem. Toksykol.* 13(1): 23-26; 1980 (10 references) (Polish).

A method is presented for the determination of propyzamide (pronamide) residues and the dynamics of its degradation. The method involves extraction of the sample with acetone; re-extraction with n-hexane; additional purification on a Florosil column (for the analysis of the soil, the re-extraction with n-hexane was omitted); followed by determination by gas chromatography. This method was used for the determination of propyzamide residues in 17 medicinal plants, representing various groups (chemical composition and morphology), and in soil after treatment with Kerb 50W (50% propyzamide) and Kerb Mix B (30% propyzamide and 32% diuron). The sensitivity of the method was in range of 0.05 mg/kg for dry plants to 0.005 mg/kg in soil. Recovery was in range 92-95%. The results permit use of this method to determine the propyzamide residues in all medicinal plants.

81-0266. Sattar, M. A.; Paasivirta, J. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Fate of the herbicide MCPA in soil. Analysis of the residues of MCPA by an internal standard method.** *Chemosphere* 9(7-8): 365-375; 1980 (35 references).

A simple method for the determination of the herbicide 2-methyl-4-chlorophenoxyacetic acid (MCPA) in soil is described. A Finnish sandy clay soil and a Bangladesh sandy loam soil were treated with MCPA at rates of 5 and 2000 ppm. The soils were incubated at 25 or 35°C, with samples collected after 0, 2, 4, 8, 12 and 16 wk of incubation. 2,6-Dimethoxyphenol was added as an internal standard, and the samples were extracted with an ether-acetone-hexane-heptane mixture. MCPA and its metabolites were measured as their pentafluorobenzoyl derivatives by glass capillary chromatography. GC/MS was used to prove the structures of the recovered components. The use of the internal standards permitted the determination of the degradation rate of MCPA in soils.

81-0267. Os'kina, V. N. (Res. Inst. Ind. Hyg. & Occup. Dis., Kiev, USSR) **Kolorimetricheskii metod opredeleniya**

natrievoi soli trikhloruksusnoi kisloty v vozdukhe. [Colorimetric method of determination of sodium salt of trichloroacetic acid in the air.] *Gig. Sanit.* 45(9): 56-57; 1980 (10 references) (Russian).

A colorimetric method for the determination of sodium salt of trichloroacetic acid (STCA) in air is described. The minimum detectable amount of STCA was 5 μg/sample. The sodium salt of trichloroacetic acid (Na-TCA) present as an aerosol after spraying is determined by drawing the air to be sampled (50-100 *l*) through a filter cartridge at the rate of 10 l/min. The filter is removed and placed in a ground glass stoppered 20 ml test tube with 5 ml of water, brought to a boil, then cooled. The liquid is filtered through a Scott No. 2 filter. The extract is made up to 5 ml, and mixed with 8 ml of 40% potassium hydroxide and 4 ml redistilled pyridine. The mixture is heated for 10 min on a boiling water bath, then shaken well for 10 min and left standing for 5 min in an ice bath. The pyridine layer is pipetted into a spectrophotometer cuvette and read at 525 nm against a reagent blank. The reaction follows the Beer-Lambert law for 5-100 μg Na-TCA. The error of the determination is 2-4%. The amount of NA-TCA present in the sample is calculated on the basis of a standard curve.

81-0268. Klisenko, M. A.; Girenko, D. B. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Gazokhromatograficheskoe opredelenie fosfororganicheskikh pestitsidov v vozdukhe. [Gas-chromatographic determination of organophosphorus pesticides in the air.]** *Gig. Sanit.* 45(9): 57-60; 1980 (7 references) (Russian).

A method of gas-chromatographic determination of organophosphorus pesticides (OPP) in air is described. It is recommended that the vapors of pesticides such as chlorophos (trichlorfon) and DDVP (dichlorvos) should be withdrawn on activated carbon (the rate of withdrawal should not exceed 0.5 l/min). The vapors of carbophos (malathion), Antio (formothion), Ciodrine (crotoxyphos), metaphos (methyl parathion) and methylnitrophos (fenitrothion) can be withdrawn on silica gel, organic solvent or sorption film.

81-0269. Tafuri, F.; Marucchini, C.; Patumi, M.; Businelli, M. (Cent. Stud. Chim. Antiparassitari, CNR, Ist. Chim. Agrar., Univ. Perugia, I-06100 Perugia, Italy) **Determination of thiabendazole residues in fruits by high performance liquid chromatography and their confirmation after *p*-nitrobenzyl derivative formation.** *J. Agric. Food Chem.* 28(2): 1150-1153; 1980 (17 references).

The determination of thiabendazole (TBZ) residues in fruits and the confirmation of their presence have been carried out by two sensitive and simple techniques. When high performance liquid chromatography with a UV detector is used for the analysis of TBZ residues, it is essential that the interfering substances be eliminated by a combined partitioning scheme and silica gel column chromatography technique. The conversion of TBZ to the *p*-nitrobenzyl derivative gives quantitative results with the procedure adopted. The recoveries from fortified fruits varied from 78.6 to 103.2% in the range 0.02-1.0 mg/kg. The sensitivity was such that TBZ could be detected down to a level of 0.002 mg/kg for pears and bananas and 0.02 mg/kg for oranges. The presence of TBZ can be quantitatively and qualitatively confirmed by a method that involves the formation of a *p*-nitrobenzyl derivative. (Author abstract reprinted by permission of the American Chemical Society)

81-0270. Rothman, A. M. (Rohm & Haas Res. Lab., Spring House, PA 19477) **Low vapor pressure determination by the radiotracer transpiration method.** *J. Agric. Food Chem.* 28(2): 1225-1228; 1980 (25 references).

A new gas saturation method was developed for determining the vapor pressure of low volatility compounds, such as pesticides. A ^{14}C-labeled pesticide or low volatility compound is coated on a sand bed, and the vapors are collected on charcoal adsorbent tubes at various temperatures below the melting point of the compound. The charcoal tubes are combusted and then counted by liquid scintillation spectrometry. Additional charcoal tubes are extracted and analyzed by high performance liquid chromatography (LC) to quantitate the ^{14}C vapor composition in the air stream. The utilization of charcoal tubes to collect ^{14}C vapors, along with the high performance LC eluent collection and counting, greatly improves the sensitivity and limit of detection over that of conventional methods. Another advantage of this method is that the determinations are done at or near the normal temperatures that the pesticide would experience in the field. The vapor pressure of *p,p'*-DDT was determined by using this method, and the results are compared with those of four other experimentors. The obtained value of 4.3×10^{-7} torr at 25°C agrees with the three best prior results. (Author abstract reprinted by permission of the American Chemical Society)

81-0271. Cessna, A. J. (Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Simultaneous extraction and detection of residues of (2,4-dichlorophenoxy) acetic acid and bromoxynil from wheat.** *J. Agric. Food Chem.* 28(2): 1229-1232; 1980 (14 references).

An analytical method for the simultaneous gas chromatographic determination of residues of 2,4-D [(2,4-dichlorophenoxy)acetic acid] and bromoxynil (3,5-dibromo-4-hydroxybenzonitrile) from wheat grain and green tissue has been developed by using an alkaline extraction procedure, derivatization with diazomethane, and electron capture detection. The limits of detection for bromoxynil and 2,4-D as the corresponding methyl derivatives were 0.01 and 0.05 ppm, respectively. No significant differences

in herbicide residues, determined at 1 day, 3 wk, and 6 wk after application, were observed whether the chemicals were applied singly or as a tank mixture. Amounts of residues of both chemicals from the mature grain and straw were less than their respective limits of detection. (Author abstract reprinted by permission of the American Chemical Society)

81-0272. Lawrence, J. F.; Panopio, L. G.; McLeod, H. A. (Food Res. Div., Food Dir., Health Prot. Branch, Ottawa, Ontario K1A OL2, Canada) **Direct analysis of the wild oat herbicide, asulam, in wheat samples by reversed-phase liquid chromatography at selected ultraviolet wavelengths.** *J. Agric. Food Chem.* 28(2): 1323-1325; 1980 (2 references).

The wild oat herbicide asulam (methyl *N*-(4-aminobenzenesulfonyl) carbamate) was extracted from whole and refined wheat flour and whole wheat cereal with acetonitrile. An aliquot of the extract was partitioned with hexane which removed much of the lipophilic coextractives. The acetonitrile layer was then evaporated to about 0.2 ml and diluted with mobile phase to 1.0 ml for liquid chromatographic analysis. Separation of asulam from other sample components was achieved with a Lichrosorb RP-8 column and a mobile phase consisting of 20% (v/v) acetonitrile in water containing 0.1% acetic acid. Detection limits were estimated to be 0.02-0.05 ppm with an average recovery of about 87% over the range 0.1-10.0 ppm in the products studied. (Author abstract reprinted by permission of the American Chemical Society)

81-0273. Chin, B. H.; Spangler, N. (T. R. Evans Res. Cent., Diamond Shamrock Corp., Painesville, OH 44077) **Automated method for determining *in vitro* cholinesterase inhibition by experimental insecticide candidates.** *J. Agric. Food Chem.* 28(2): 1342-1344; 1980 (5 references).

An automated method for the determination of electric eel cholinesterase (ChE) inhibition by experimental insecticide candidates was developed. It was based on the manual procedure of Ellman using acetylthiocholine iodide (ATChI) as the substrate and 5,5′-dithiobis(2-nitrobenzoic acid) (DTNB) as the color reagent. The substrate and color reagent concentrations were individually varied in order to determine optimum reaction conditions. The ChE assay conditions were found to be 1.5 m*M* ATChI and 0.38 m*M* DTNB. The reproducibility of the automated method was evaluated by the simultaneous analysis of 10 aliquots from each of three electric eel ChE solutions containing 247, 413, and 1054 units/l ChE. Coefficients of variation (CV) of 5.9-9.0 were obtained for each sample, respectively. Variation between runs was examined by comparing the three electric eel ChE solutions containing 270, 513, and 1247 units/l ChE for 10 different days. A CV of 3.7-7.9% was obtained for each sample, respectively. The test requires an initial 30 min of reagent preparation and thereafter as many as 400 samples/hr can be analyzed. The sample volume requirement is as little as 20 ml of enzyme solution. (Author abstract reprinted by permission of the American Chemical Society)

81-0274. Papadopoulou-Mourkidou, E.; Iwata, Y.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Utilization of an infrared detector for selective liquid chromatographic analysis. Formulation analysis of the pyrethroid insecticides resmethrin, permethrin, and fenvalerate.** *J. Agric. Food Chem.* 28(6): 1043-1049; 1980 (13 references).

The pyrethroid insecticides resmethrin [(5-benzyl-3-furyl) methyl *cis,trans*-(±) -2,2-dimethyl-3- (2-methyl-1-propenyl) cyclopropane carboxylate], permethrin [3-phenoxybenzyl *cis,trans*-(±)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate], and fenvalerate [(±)-α-cyano-3-phenoxybenzyl (±)-2-(4-chlorophenyl)-3-methylbutyrate] in formulated material were analyzed by using high performance liquid chromatography with a silica column (10 μ Partisil) and carbon tetrachloride mobile phase containing 0.85, 1 and 2.5% (v/v) acetonitrile, respectively, for the three insecticides. The in-line detectors used were an infrared (IR) detector operated at the carbonyl or the C-O absorption band of the insecticides and an ultraviolet detector operated at 280 nm. The selectivity of the IR detector was demonstrated in that aromatic solvents in the formulation did not interfere in the analysis. Minimum detectable levels for the IR detector were 1 μg for resmethrin and permethrin and 2 μg for fenvalerate. (Author abstract reprinted by permission of the American Chemical Society)

81-0275. King, J. R.; von Windeguth, D. L.; Burditt, A. K., Jr. (Subtropical Hortic. Res. Unit., Agric. Res., SEA, USDA, Miami, FL 33158) **An electron capture gas chromatographic method for determination of residues of 1,2-dibromoethane in fumigated grapefruit.** *J. Agric. Food Chem.* 28(6): 1049-1052; 1980 (11 references).

An analytical procedure was developed for determining residues of 1,3-dibromoethane (ethylene dibromide; EDB) in grapefruit. The method involves steam distillation from a benzene-water mixture for separation and cleanup. When a gas chromatograph equipped with a ^{63}Ni electron capture detector was used to determine the concentration of EDB present in fortified samples of grapefruit, residues as low as 0.00038 mg/kg could be detected. The method was used to study the effect of storage time and temperature on the residue of EDB in fumigated grapefruit. Residues in fiberboard carton material were also determined. (Author abstract reprinted by permission of the American Chemical Society)

81-0276. Chau, A. S. Y.; Lee, H. B. (Canada Cent. Inland Waters, Water Qual. Branch, Environ. Canada, Burlington, Ontario L7R 4A6, Canada) **Analytical reference materials. III. Preparation and homogeneity test of large quantities of wet and dry sediment reference materials for long term polychlorinated biphenyl quality control studies.** *J. Assoc. Off. Anal. Chem.* 63(5): 947-951; 1980 (9 references).

This paper describes the preparation of large quantities of wet and dried lake sediments to be used as analytical reference materials for long term polychlorinated biphenyl (PCB) quality control studies. Five hundred and forty subsamples (15-20 g each) of wet sediment spiked with PCBs and more than 4900 subsamples (25-30 g each) of naturally contaminated dried sediment were prepared. Evidence of homogeneity between subsamples in each group is presented. The natural sample was found to contain only small amounts of organochlorines (hexachlorobenzene and *p,p'*-DDE), and was concluded to be ideal for PCB sediment analysis quality control purposes. (Author abstract by permission, modified)

81-0277. Tuinstra, L. G. M. T.; Traag, W. A.; Keukens, H. J. (State Inst. Qual. Control Agric. Prod., NL-6708 PD Wageningen, The Netherlands) **Quantitative determination of individual chlorinated biphenyls in milkfat by splitless glass capillary gas chromatography.** *J. Assoc. Off. Anal. Chem.* 63(5): 952-958; 1980 (29 references).

A method is described for determining individual polychlorinated biphenyls (PCBs) in milkfat at the ppb level. Extraction and major cleanup are done simultaneously by saponification of the milkfat. Several organochlorine pesticides (α- and β-BHC, lindane and heptachlor epoxide) are destroyed by the saponification process. DDT is converted to DDE. Hexachlorobenzene, endrin and dieldrin are not affected. After final cleanup on basic alumina, the concentrated extract is injected under splitless conditions on a capillary column coated with CP-Sil 7 stationary phase. The recovery of several individual PCBs from milkfat at a level of 25 ppb is better than 80%. The reproducibility for duplicates analyzed on several days showed standard deviations from 0.2 to 0.9 ppb for 19 individual chlorinated biphenyls. Some preliminary results for 165 samples of milkfat are reported. (Author abstract by permission, modified)

81-0278. Griffin, D. A.; Marin, A. B. (Environ. Health Serv. Cent., Oregon State Univ., Corvallis, OR 97331) **Optimization of chromatographic conditions for the separation of *p,p'*-DDE from Aroclor 1254 on silica, using azulene as indicator.** *J. Assoc. Off. Anal. Chem.* 63(5): 959-964; 1980 (11 references).

Aroclor 1254 is separated from *p,p'*-DDE on a fully activated silica gel column with the aid of azulene as a visual marker. The azulene is useful in determining the best cutpoint for separating these compounds and has been valuable in characterizing the effects of several parameters of the separation system, such as the aromatic content of the eluting solvent, adsorbent activity, and lipid and pesticide load capacity. Several brands of silica are compared for their ability to separate these compounds. (Author abstract by permission)

81-0279. Stahr, H. M.; Hyde, W.; Gaul, M. (Diagn. Lab., Iowa State Univ., Ames, IA 50011) **Determination of extractable mirex in whole blood.** *J. Assoc. Off. Anal. Chem.* 63(5): 965-969; 1980 (5 references).

A method for the determination of free mirex in blood has been developed in which whole blood is extracted with acetone-hexane (9 + 91), passed through Na_2SO_4, concentrated, and analyzed by electron capture gas-liquid chromatography (GLC). Results were highest for fresh blood. Recoveries were verified by determining ^{14}C-labeled mirex before and after extraction. Little mirex was detected in the samples after extraction. Hydrolysis of residual blood indicates that a metabolite of mirex is released. The possible metabolite has a GLC retention time and mass spectrum which resemble hydroxy metabolites of mirex. (Author abstract by permission)

81-0280. Blackman, G. L.; Ho, A. C.; Jozsa, A.; Kelly, J. D. (Victorian Coll. Pharm. Ltd., Sch. Pharm. Chem., Parkville, Victoria 3052, Australia) **High performance liquid chromatographic determination of phenothiazine residues in sheep tissues.** *J. Assoc. Off. Anal. Chem.* 63(5): 988-991; 1980 (11 references).

A high performance liquid chromatographic (HPLC) technique is described for the determination of residue levels of the anthelmintic drug phenothiazine in sheep tissues. Phenothiazine was administered to sheep which were slaughtered after withholding periods of 24, 48 and 72 hr. Residues of phenothiazine were then extracted from tissue samples by homogenization in methanol. The HPLC analysis of the extracts involved separation on a 10 μm silica column using a mobile phase of 0.3% *n*-propanol in cyclohexane. The lower limit of detection by ultraviolet absorption at 254 nm was 0.05 ppm. (Author abstract by permission)

81-0281. Karr, J. J. (Pennwalt Corp., King of Prussia, PA 19406) **Gas-liquid chromatographic method for the analysis of microencapsulated ethyl parathion and methyl parathion insecticides: collaborative study.** *J. Assoc. Off. Anal. Chem.* 63(5): 999-1002; 1980 (1 reference).

The determination of ethyl parathion in Penncap-E insecticide was studied collaboratively by 14 laboratories. The assay of methyl parathion in Penncap-M insecticide

was studied by 8 laboratories. The original method which was adopted official first action for methyl parathion specified dimethoate, which is currently classified as a suspected carcinogen, as the internal standard. The current collaborative efforts were conducted as a supplemental study to evaluate the performance of the new internal standard, bis-2-methoxyethyl phthalate, and to test the gas-liquid chromatographic method for microencapsulated ethyl parathion (internal standard, dibutyl phthalate). The method uses essentially the same grinding and extraction with acetonitrile as the original study. At the 20% methyl parathion level, the standard deviation within laboratories was 0.186%, and among laboratories, 0.737%. Two formulations of ethyl parathion at approximately 16 and 24% were analyzed in replicate on 2 days by the same analyst, and provided excellent agreement within laboratories as well as among laboratories. The standard deviation (pooled) within laboratories was 0.284% and among laboratories, 0.518%. The method has been adopted as official first action. (Author abstract by permission)

81-0282. Argauer, R. J. (Anal. Chem. Lab., Agric. Res., SEA, USDA, Beltsville, MD 20705) **Extent of microencapsulation in pesticide formulations of diazinon, methyl parathion, and ethyl parathion.** *J. Assoc. Off. Anal. Chem.* 63(5): 1003-1006; 1980 (7 references).

A method is described that compares the amount of encapsulated pesticide and the amount of free pesticide as a percentage of the total pesticide content of a formulation. Formulations that contained pesticides encapsulated in a nylon-type polymer skin were more than 99% encapsulated. The method can be extended further to measure the amount of non-encapsulated pesticide (e.g., emulsifiable concentrates) in mixtures with encapsulated pesticides. The formulations studied were Knox-Out (encapsulated diazinon), Penncap-M (encapsulated methyl parathion), and Penncap-E (encapsulated parathion). (Author abstract by permission)

81-0283. Lamoureux, C. H.; Feil, V. J. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Gas chromatographic and mass spectrometric characterization of impurities in technical methoxychlor.** *J. Assoc. Off. Anal. Chem.* 63(5): 1007-1037; 1980 (13 references).

The impurities in technical methoxychlor were concentrated by removing most of the 1,1,1-trichloro-2,2-bis-(4-methoxyphenyl)ethane by recrystallization. Analysis of the impurities by gas chromatography-mass spectrometry provided evidence for more than 50 compounds. Twenty-five of these were identified through interpretation of mass spectra and synthesis. (Author abstract by permission)

81-0284. Winterlin, W.; Whitehead, E.; Mourer, C. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Gas-liquid chromatographic determination of *S*-[(5-methoxy-2-oxo-1,3,4-thiadiazol-3(2*H*)-yl) methyl] *O,O*-dimethyl phosphorodithioate (Supracide) and its monoxone metabolite in safflower seed, meal, and oil.** *J. Assoc. Off. Anal. Chem.* 63(5): 1105-1108; 1980 (3 references).

A gas-liquid chromatographic (GLC) method for determining residues of the insecticide-acaricide Supracide {*S*-[5-methoxy-2-oxo-1,3,4-thiadiazol-3(2*H*)-yl)-methyl] *O,O*-dimethyl phosphorodithioate; methidathion} and its monoxone metabolite in safflower seed, meal and oil is presented. Supracide and its monoxone metabolite are separated by partitioning with acetonitrile-sodium sulfate and petroleum ether. The petroleum ether fraction containing the Supracide is extracted with acetonitrile and further cleaned up on a Florisil column before determination by GLC, flame photometric detection (FPD). The monoxone metabolite is partitioned from the acetonitrile-sodium sulfate fraction with chloroform and cleaned up on a Florisil column before GLC/FPD. Average Supracide recoveries were 86, 82.5 and 92%, and average Supracide monoxone recoveries were 85.7, 81.5 and 89%, in seed, meal and oil, respectively. The limit of detection was 0.005 ppm for both compounds on all tissues analyzed. (Author abstract by permission)

81-0285. George, D. A. (Yakima Agric. Res. Lab., Agric. Res., SEA, USDA, Yakima, WA 98902) **Determination of residues of fensulfothion and its metabolites in Chinese cabbage, Japanese radish, and turnips.** *J. Assoc. Off. Anal. Chem.* 63(5): 1109-1113; 1980 (10 references).

A method was developed using a selective nitrogen-phosphorus detector to determine the combined total residues, as the oxygen analogs, of fensulfothion {*O,O*-diethyl *O*-[*p*-(methylsulfinyl)-phenyl]phosphorothioate} and its 3 metabolites. The procedure was used to determine harvest residues in Chinese cabbage, Japanese radish, and turnips treated with 2 application rates of fensulfothion. Residues found after application of 2 oz. active ingredient (AI)/1000 lineal ft (56.7 g/304 lineal m) of row ranged from 0.026 ppm for Japanese radish to 1.543 ppm for turnip greens. When the application rate was doubled, the amount of residue found was approximately doubled. (Author abstract by permission)

81-0286. Krause, R. T. (Div. Chem. Phys., US FDA, Washington, DC 20204) **Multiresidue method for determining *N*-methylcarbamate insecticides in crops, using high performance liquid chromatography.** *J. Assoc. Off. Anal. Chem.* 63(5): 1114-1124; 1980 (12 references).

A method is described for determining 7 carbamate insecticide residues (aldicarb, bufencarb, carbaryl, carbofuran, methiocarb, methomyl, and oxamyl) and 4

related carbamate metabolites (aldicarb sulfone, aldicarb sulfoxide, 3-hydroxy carbofuran, and methiocarb sulfoxide) on fruits, vegetables, and grains. Residues are extracted from the crops using methanol, and plant coextractives are removed using solvent partitioning and a charcoal-silanized Celite column. The carbamate residues are then separated on a reverse phase high performance liquid chromatographic (HPLC) column using an acetonitrile-water gradient mobile phase. The eluted residues are detected using an in-line post-column fluorometric detection technique. Recovery data were obtained by fortifying 9 crops (apples, carrots, green beans, green peppers, lettuce, oranges, soybeans, strawberries, and tomatoes) with the 7 carbamates and 4 carbamate metabolites. Except for aldicarb sulfoxide, pesticide recovery averaged 99% at both the 0.05 and 1.0 ppm fortification levels, with standard deviations of 5.0% ($n = 86$) and 5.6% ($n = 87$), respectively. The average recovery for aldicarb sulfoxide, a very polar carbamate metabolite, was 55 and 57% at the 0.05 and 1.0 ppm levels, respectively. An inter-laboratory study of the method was conducted. Recovery data were obtained by fortifying grapes and potatoes with carbaryl, carbofuran, 3-hydroxy carbofuran, methiocarb, and methomyl at levels ranging from 0.05 to 15 ppm. Determinations were made in duplicate and the average recovery was 95% (range 87-101%). (Author abstract by permission)

81-0287. Watts, R. R.; Hodgson, D. W.; Crist, H. L.; Moseman, R. F. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Improved method for hexachlorobenzene and mirex determination with hexachlorobenzene confirmation in adipose tissue: collaborative study.** *J. Assoc. Off. Anal. Chem.* 63(5): 1128-1134; 1980 (5 references).

A previously published method for determination and confirmation of hexachlorobenzene (HCB) in adipose tissue was also applied to mirex residues. A modified procedure for both residues was collaboratively studied by 12 laboratories. The procedure specifies direct application of an extracted or rendered fat sample to a Florisil cleanup column and one-fraction elution. Mirex and HCB are determined by direct GLC of the concentrated eluate. HCB residues are then confirmed by reaction with isopropanol to form the disubstituted bis-isopropoxytetrachlorobenzene (BITB) derivative. Mirex residues are destroyed by this reaction. All participants were asked to analyze an unknown standard mixture of HCB and mirex and 10 rendered chicken fat samples consisting of 1 blank and 9 samples at each of 3 fortification levels. The HCB fortifications of 20.0, 33.3 and 50.0 ppb yielded average interlaboratory recoveries of 89.6, 87.4 and 92.6%, respectively. The respective coefficients of variation (CV) for HCB results were 9.1, 6.8 and 10.0%. The mirex fortifications of 150, 300 and 500 ppb yielded average interlaboratory recoveries of 89.0, 90.2 and 92.3%, respectively. The respective CV values for mirex results were 7.6, 16.5 and 18.1%. The method has been adopted as official first action. (Author abstract by permission)

81-0288. Ogierman, L.; Rycaj, B.; Silowiecki, A. (Inst. Plant Prot., PL-44153 Sosnicowice, Poland) **Thin layer and gas chromatography of the glycol esters of phenoxy acids.** *J. Chromatogr.* 177: 401-404; 1979 (15 references).

Phenoxy acids and their esters with aliphatic alcohols are actually used as herbicides. The chromatographic methods of separation and identification have been described both for the formulations and for the residues. This group of herbicides was analyzed by thin-layer chromatography (TLC), gas chromatography and high-performance liquid chromatography (HPLC). In our work, new herbicides prepared by esterification of polyethyleneglycol 300 with selected phenoxy acids were separated and identified using TLC and GC. (Author abstract by permission)

81-0289. Ryan, J. J.; Pilon, J. C. (Food Dir., Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada) **High-performance liquid chromatography in the analysis of chlorinated dibenzodioxins and dibenzofurans in chicken liver and wood shaving samples.** *J. Chromatogr.* 197(2): 171-180; 1980 (12 references).

High-performance liquid chromatography (HPLC) has been used to clean up chicken liver and wood shaving samples for their subsequent analysis by mass spectrometry (MS). With a reversed-phase system and discrete fraction collection, hexa-, hepta-, octachlorodibenzodioxin and octachlorodibenzofuran [from pentachlorophenol (PCP) contamination] have been detected in wood shavings and chicken livers to a lower level of 25 pg/g. With the use of HPLC as a cleanup tool, the MS determination both on the probe and by gas chromatography-MS resulted in an improved peak shape and a stronger more accurate signal for the dioxins and furans. (Author abstract by permission)

81-0290. Van der Poll, J. M.; Van de Lagemaat, D. (Div. Nutr. & Food Res. TNO, Inst. CIVO-Anal. TNO, 3700 AJ Zeist, The Netherlands) **Direct determination of propoxur in plant tissues by gas chromatography with an alkali flame-ionization detector.** *J. Chromatogr.* 197(2): 263-266; 1980 (9 references).

A method for determination of the concentration of propoxur residues in various substances based on direct GLC determination was established. A Carbowax 20M-modified column packing (Ultrabond), was used to facilitate the adsorption of the intact carbamate. The fact that the clean-up and extraction procedures are less laborious than other methods and that the GLC determination is faster makes this method suitable for vegetable and fruit samples obtained in field trials.

81-0291. Cotterill, E. G. (Agric. Res. Counc. Weed Res. Organ., Begbroke Hill, Yarnton, Oxford OX5 1PF, England) **Determination of residues of methazole and its metabolites, 1-(3,4-dichlorophenyl) -3-methylurea and 1-(3,4-dichlorophenyl) urea in soil by high-performance liquid chromatography.** *J. Chromatogr.* 197(2): 267-270; 1980 (8 references).

High performance liquid chromatography was used to effect the separation and determination of the herbicide methazole and its metabolites DCPUM and DCPU without requiring derivatization or clean-up. The compounds were extracted with methanol. Recovery of the 3 chemicals from wet soil was satisfactory. When using dry soil, the results demonstrated that DCPMU became less extractable over time. When dry soil was extracted after 120 hr with methanol-water (4:1, v/v) the recovery was 93.4% comparable to that from wet soil. It is suggested that the presence of water helped break down the soil structure, allowing the extractant to work on a greater surface of the soil than was true in dry situations. The method is not suitable for the less phototoxic degradation product of DCPMU, 3,4-dichloroaniline, as methanol is not an effective extractant.

81-0292. Burns, A. J.; Tomkins, D. F. (Monsanto Agric. Prod., St. Louis, MO 63166) **The determination of *N*-(phosphonomethyl)glycine in formulation and technical samples by high pressure liquid chromatography.** *J. Chromatogr. Sci.* 17: 333-335; 1979 (5 references).

A rapid and sensitive procedure for the determination of N-(phosphonomethyl) glycine (PMG; glyphosate), active ingredient in the herbicide Roundup, is described. A high pressure liquid chromatographic procedure was employed, and Partisil SAX columns were found to be stable. The procedure uses a permanently bonded microparticulate strong anion exchange column for the determination of PMG in < 20 min. The detection limit is 2.5 μg/ml.

81-0293. Cowen, W. F.; Baynes, R. K. (Environ. Syst. Div., Catalytic Inc., Philadelphia, PA 19102) **Estimated application of gas chromatographic headspace analysis to priority pollutants.** *J. Environ. Sci. Health A* 15(5): 413-427; 1980 (18 references).

Estimates are given of the application range of the static headspace method for analyzing EPA priority pollutants. Theoretical distribution coefficients are calculated from vapor pressure and aqueous solubility data reported in the literature. Twenty-six priority pollutants were studied, including *trans*-1,2-dichloroethylene, methylene chloride, 1,2-dichlorobenzene (*o*-dichlorobenzene), 1,3-dichlorobenzene, naphthalene, and nitrobenzene. The estimated minimum detectable quantities by electrolytic conductivity detection were 0.03 ng for *trans*-1,2-dichloroethylene (ethylene dichloride), 0.05 ng for methylene chloride and 0.20 ng for 1,3-dichlorobenzene and 1,2-dichlorobenzene.

81-0294. Issaq, H. J. (Chem. Carcinog. Progr., NCI Frederick Cancer Res. Cent., Frederick, MD 21701) **Modifications of adsorbent, sample and solvent in thin layer chromatography.** *J. Liq. Chromatogr.* 3(10): 1423-1435; 1980 (50 references).

Various modifications of thin layer chromatography samples, adsorbents and solvents which can aid in achieving the separation of complex chemical mixtures are reviewed. Adsorbent modifications include both the use of specific chemical reactions and different methods of solvent impregnation. Modifications for samples are given for those in solution and on the plate. Solvent modifications include solvent polarity, the addition of acids and bases, and the use of micelle forming surfactants. The surfactants used provided effective separation of pesticides on polyamide and alumina, but not on silica gel plates. It is noted that soap and ligand exchange chromatography have a great potential in TLC separations.

81-0295. Babkina, E. I.; Dibtseva, A. V.; Siverina, A. A. (Inst. Exp. Meteorol., USSR) **Gazokhromatograficheskoe opredelenie pestitsidov v pochve i vode. [Gas-chromatographic determination of pesticides in soil and water.]** *Khim. Sel'sk. Khoz.* 18(8): 55-58; 1980 (17 references) (Russian).

A gas-chromatographic method of determination of organophosphorus and organochlorine pesticides (OCP) in the soil and water is described. The minimum detectable amounts ranged from 0.005-0.06 ng for OCP, 0.1 ng for metaphos (methyl parathion), 0.4 ng for phosalone, 0.2 ng for carbophos (malathion) and 0.5 ng for phosphamide (dimethoate).

81-0296. Bennett, M. A. (Chromatogr. Lab., Dep. Chem., Polytech. North London, Holloway, London N7, England) **Assay and recovery in environmental analysis.** *Lab. Pract.* 29(9): 931; 1980.

A description is presented of an assay assessment project, relating to the analysis of organo-phosphorus (OP) pesticides in river water using gas-liquid chromatography and flame-photometric detection. About 20 OP pesticides were studied. River water was spiked with pesticides at calculated concentration levels. Factors affecting recovery, including extraction procedure, concentration technique, and separation method, are discussed. Also discussed are factors relating to the choice between internal and external standards.

81-0297. Stan, H. J. (Inst. Lebensmittelchem., Tech. Univ. Berlin, Berlin, BRD) **Anwendung der Gaschromato-**

graphie-Massenspektrometrie-Kopplung mit Datensystem in der Rueckstandsanalytik. [Use of coupled gas chromatography-mass spectrometry with a data system in residue analysis.] *Lebensmittelchem. Gerichtl. Chem.* 33(3): 54-58; 1979 (3 references) (German).

The advantages and possibilities of the gas chromatography-mass spectrometry-computer combination in pesticide residue analysis are described, based on the example of the Finnigan 4023 system. Corrected mass spectra are obtained from the crude spectra by electronic background subtraction. These corrected spectra are free from foreign ions. The corrected mass spectra are compared with those of test substances and agreement is checked by the generation of differential spectra. The substances are differentiated automatically by comparing the corrected mass spectra against a library of some 25,000 mass spectra. Highly sensitive detection of very low residue levels in food (in the low ppb range) is possible by mass fragmentography with selected ion monitoring. The process is illustrated, based on a mixture of parathion, fenthion and bromophos, which was successfully resolved and quantitated by this technique.

81-0298. Visweswariah, K.; Majumder, S. K.; Raju, G. S. (Cent. Food Technol. Res. Inst., Mysore 570013, India) **GLC analysis of X-factor, by-product I and by-product II (products obtained in the lindane extraction process from commercial BHC).** *Pesticides* 14(7): 16-21; 1980 (10 references).

Studies were carried out to identify and quantitate the components present in the 3 by-products (X-factor, by-product I and by-product II) obtained in the lindane isolation process from technical BHC. It is suggested that these by-products can have safe and economic applications in pest control. The techniques used for identification were thin layer chromatography and gas-liquid chromatography with electron capture detection. The principal by-products showed 7 distinct spots on TLC. The remaining components appeared as a single unresolved diffused spot. The new isomer (X_3) separated clearly in 5% QF_1 column between α and γ isomers. The toxicity of the various isomers is discussed.

81-0299. Zycinski, D. (Dep. Munic. Hyg., State Dep. Hyg., Warsaw, Poland) **Oznaczanie chlorofenu w wodzie metoda chromatografii cienkowarstwowej. [Chlorophen determination in water by thin-layer chromatography.]** *Rocz. Panstw. Zakl. Hig.* 31(4): 419-422; 1980 (7 references) (Polish).

Concentrations of Chlorophen (PCP) in water were determined in the presence of polychlorinated and organophosphorus insecticides containing chlorine atoms. Thin-layer chromatography was used with n-hexane extraction. Plates were covered with Merck silica gel G. A mixture of methylene chloride and acetone, 1:3, was used to develop the TLC plates. Chlorophen spots were developed with silver nitrate and ultraviolet irradiation. This method was able to detect levels of Chlorophen up to 1 μg.

81-0300. Mochizuki, E.; Shimizu, G.; Fukazawa, Y.; Kubota, S. (Yamanashi Pref. Inst. Public Health, Kofu, Yamanashi, Japan) **[Examination of the method for determination of dieldrin in textile goods by steam distillation.]** *Tamanashi-Kenritsu Eisei-Kogai Kenkyusho Nempo (Annu. Rep. Yamanashi Inst. Public Health)* 23: 47-49; 1979 (9 references) (Japanese).

Steam distillation was applied in the determination of dieldrin in textile goods, and the results were compared with the results obtained by the official Japanese method. For the test 1 g of finely chopped textile is placed in a 500 ml pear-shaped flask with 100 ml of water. Steam distillation is conducted at the rate of 10 ml/min to obtain 300 ml of distillate. The distillate is extracted with 80 ml n-hexane in a 500 ml separating funnel, shaking for 5 min. The hexane layer is dried with anhydrous sodium sulfate, the volume made up to 100 ml, and the dieldrin content determined by injecting 2 ℓ of this solution onto a gas chromatograph and comparing the peak height obtained with a calibration curve. The gas chromatographic conditions were: column DEGH-H_3PO_4 (2 + 0.5%), Chromosorb W 80-100 mesh; column temperature 205°C, injector temperature 250°C; sensitivity 10 megohm; range 2×10^{-2}, carrier gas N_2, 55 ml/min. The recovery of dieldrin from fortified wool cloth containing 36.8 g/g was 100%, compared to 99% recovery with the official method. The present method is superior to the official method with respect to simplicity of the procedure, shorter time per run (1 hr compared to 3), and smaller amount of solvent for extraction: 150 ml as compared to 700 ml.

See also 81-0006, 81-0036, 81-0062, 81-0095, 81-0117, 81-0157, *and* 81-0209.

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